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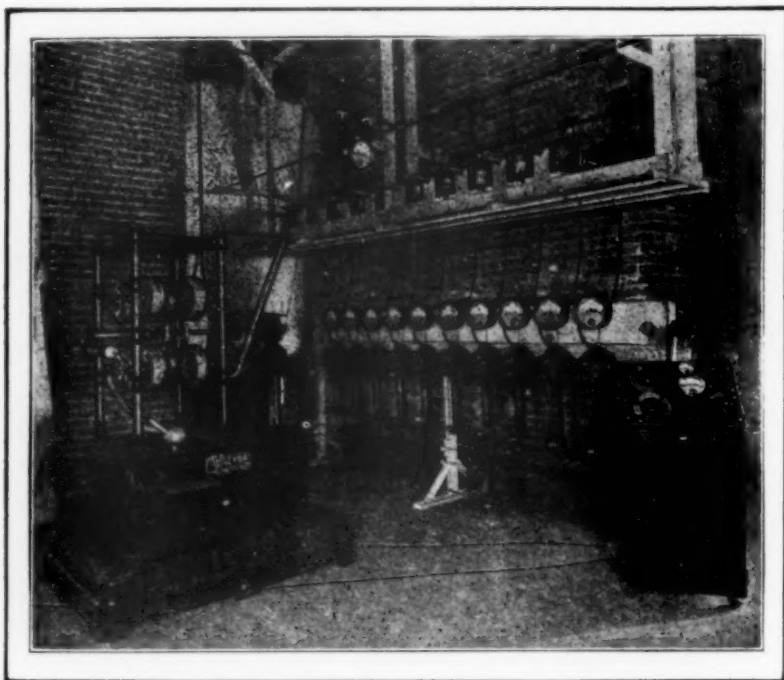
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PROOF BY PERFORMANCE

The "Snook-Special" Deep Therapy Diagnostic Machine Proves Up Under Supreme Test

THE design of the "Snook-Special" Deep Therapy Diagnostic Machine was to provide for not only the present 200,000-volt Coolidge tube of 8 milliamperes capacity, but also in view of future Coolidge tube developments calling for higher milliamperes at this voltage.

It was desired that when offering the "Snook-Special" to the Roentgenologist a definite statement regarding its capacity could be made, substantiated by records of actual performance.

To conduct a test under conditions which would be practically equivalent to those which would prevail were a 30 M. A. Coolidge Tube available, Victor engineers connected in parallel ten deep therapy Coolidge tubes of the present type, each with a separate Victor-Kearsley Stabilizer and filament trans-

former, thus providing means for control of current in each tube, independent of the others. With the "Snook-Special" delivering 30 milliamperes of current, these tubes are energized simultaneously, at an average of 3 M. A. in each tube.

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This demonstration is for the purpose of proving machine capacity and performance under conditions more difficult and exacting than any X-ray machine has ever been called on to meet. This is not intended as a demonstration of the feasibility of running tubes in multiple.

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Effect of X-Ray Upon Histology of Nodes in Some Cases of Lymphadenopathy, Found by Adenectomy During Treatment*

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THERE are available many publications dealing with the effect of irradiation upon the clinical phases of sarcoma, leukemia and the pseudoleukemic conditions, and with the behavior of lymphocytes under moderate or massive doses, but there is only a handful of articles in which the anatomical changes in lymphatic tissue are well described. Heineke first emphasized that lymph cells are peculiarly susceptible to roentgen rays but this was after Pusey and Senn had indicated the favorable results obtained in leukemia by treatment with these rays. The really satisfactory literary references begin in 1906 when Warthin published his first observations, followed by several papers, the most important of which are given in the reference list. The observations of this writer have been confirmed and amplified by David and Desplats, Pancoast, Clarke, and Murphy and his associates.

A summary of the work of these authors might be put as follows: Lymphocytes are among the most, if not indeed the most, sensitive cells of the body to x-ray and radium, increasing in numbers under mild doses, decreasing under high doses. These changes may be perceptible almost immediately in circulating lymphocytes but the alterations in the histology of glands are best seen after the lapse of some days, these varying with the intensity of the exposure.

Mild doses playing upon lymphatic tissue cause low grade hyperplasia in chords and follicles while protracted or repeated exposures are followed by a diminution of small mononuclears. After the reduction of the normal adult lymphocytes from repeatedly radiated glandular tissues, larger cells develop resembling the normal lymphoblasts in appearance, which seem to act as

lymphoblasts, somewhat resistant to the action of the rays. If radiation of normal nodes be not too prolonged, for example, to the extent of fibrous tissue stimulation, normal architecture and histogenesis will probably return. However, under pathological conditions the altered lymphoblasts continue to make approximately adult cells but the anatomy of the individual is never perfectly normal nor does the histological construction of lymphatic tissue ever return to normal. It would seem that the morbid process is rarely if ever eradicated, and that a node once started on a pathological course never returns to a normal histogenesis and architecture under the action of the rays.

The stage of degeneration in lymphatic tissue is demonstrated by swollen or vacuolated cells, by pyknotic or by fragmented nuclei and by "chromatin dust." Reactive phenomena take the form of an increase of the lymphoblasts noted above, a prominence of endothelial cells and later connective tissue overgrowth; both of the latter two seem stimulated by x-ray directly or by the degeneration products of cellular death. The endothelial cells, because of evidence of phagocytosis in them and because they seem to multiply during treatment, have been thought to participate not only in the removal of cellular debris but actually to effect the destruction of lymphocytes. David and Desplats believe these cells to be very important and that irradiation is effective while they are still active; when fibrosis is excessive and chokes them out of existence the favorable effects of irradiation cease. Connective tissue increase is usually explained as a reparative process as well as one due to stimulation by the rays. In addition to the above changes there may be intravascular endothelial hyperplasia or blood coagulation or both, with the resultant destruction of the lumen of vessels, thereby depriving some sec-

tions of tissue of nutrition. When these changes are active it is not difficult to imagine that normal anatomy of lymphatic tissue does not return after x-ray treatment of hyperplasias, tumors or inflammations.

The foregoing summary is from work largely of experimental or necropsical character and so far as one can learn from the texts is not based upon a study of cases of lymphadenopathy diagnosed with the aid of a bioscopic adenectomy or upon material removed during the course of irradiation treatment. The material upon which the present paper is based came from cases in which a diagnosis was made by clinical history assisted by a pathological report upon the histology of an excised lymph node, the case then treated and a second bioscopic adenectomy performed. The only strictly comparable work in the literature appeared recently from Laignel-Lavastine and Coulaud, who reported a carefully observed and critically analyzed instance of Hodgkin's disease cured (?) by roentgen therapy; they themselves add a question mark. An abstract of their case is as follows: A man of 30 rather rapidly developed numerous hard, isolated, movable glands in neck and axilla with evidences of a mass in the mediastinum. The spleen was not enlarged. Blood counts were within normal limits. The first diagnostic adenectomy revealed a gland, the seat of recent sclerosis in strands especially near the periphery, many polynuclears arranged in small groups, numerous young connective tissue cells, many eosinophiles and a moderate number of very large cells of unusual shape with multiple nuclei, some arranged peripherally. Roentgen ray treatment as described by the authors was given eight times, five hours each, and no area received more than six exposures, the second gland to be excised received ten hours' treatment. This description is not very clear and, if interpreted strict-

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ly, indicates a very massive and protracted exposure; it would at least imply a thorough treatment. Clinically the patient was at first very ill during the treatment, but suddenly, two weeks after the first dose, an improvement began and the patient expressed himself cured. The glands rapidly diminished in size until six weeks later only a few small hard nodes were palpable in the carotid region. At that time a second adenectomy was done. The microscopical section showed the gland to be nearly entirely sclerotic but the connective tissue was so active that it resembled sarcoma. Polynuclears were absent and only a few transitional forms and eosinophiles were present. The very large cells with multiple nuclei were absent. Plasma cells were numerous in the connective tissue areas. The observers would emphasize the advance of the sclerosis and the absence of polynuclears while we wish to call attention to the failure to find in the second gland the large cells usually called Reed cells. Laignel-Lavastine and Coulaud are astonished that such moderate (?) irradiation could have been responsible for so prompt a clinical improvement and for such profound changes in the lymph node. They wisely draw no conclusion that the disease is cured although there was at time of reporting no progression of the process and the patient believed himself cured.

Our own material comprises seven cases, five of which we were permitted to study clinically in the wards of Dr. Alfred Stengel at the University Hospital, while two came from the Presbyterian Hospital in the services of Dr. Tallev. Dr. Hamill, Dr. Newcomet and Dr. Fiman. Some of the cases were treated by Dr. H. K. Pancoast who has been kind enough to follow them and to allow us to use his notes and opinions. We wish to express our thanks to all these gentlemen for the permission to use the clinical material.

The periods of clinical observation were of sufficient length in most cases to test the validity of the diagnosis, in others this latter was established at autopsy. Two of the cases are known to be still alive, one was reported doing well a year after discharge while the remaining four are dead; autopsies were obtained of all four.

Case I: This was the case of a white married woman of 25 who was admitted with a diagnosis of Hodgkin's disease of two and one-half years standing. The individuality of this case was that it was in the cellular stage when the first biopsy was performed, that the glands were discrete and did not form large tumefactions in the neck. Some mediastinal growth and a moderate pleural effusion existed. The first gland removed showed the following:

(514) Section shows wide irregular fibrous capsule, the spindly nuclei being mostly adult. Trabeculae wide, adult in middle and young at edges. Along margin of the trabeculae there are numerous small round cells as well as some young connective tissue cells. The marginal sinus is pressed shut, its place being indicated by a few elongated cells and middle sized mononuclears. This also holds for the trabecular sinuses. The follicles as such do not exist but here and there are diffuse groups of small round cells which may have been follicles. Chords are not certainly identified but there are irregular strands of small and middle sized mononuclears, rather irregularly placed through section. Sinuses cannot be identified but irregular groups of middle sized and large mononuclears suggest that sinuses have existed. The section as a whole is made of irregularly arranged groups and columns of cells aforementioned, in the interspaces of which lie a great number of the largest mononuclears with one to four nuclei and a clear nucleolus. There is sufficient space where they are to call it a lacuna. Some of these cells give the impression of phagocytes. There are a very small number of reticulum cells scattered here and there, generally speaking, but there are several areas in which spindly, deeply staining connective tissue nuclei are grouped—beginning fibrosis. Such cells lie in and around small and middle sized mononuclears more than around the larger mononuclears. Fibers, on the other hand, seem to be distributed to trabeculae and their immediate surroundings. Arterioles have very prominent endothelial lining as do venules

and some of the former are being compressed to a structure with ringed nuclei. Endothelioid cells are prominent both as free ones lying in lacunae and in blood passages and in what may have been sinuses. Plasma cells are very rare. Mast cells none, eosinophiles very numerous, highly granular and mostly of the polynuclear variety although a few mononuclears are seen. Neutrophils are moderately common but particularly where the large endothelial cells are not, that is, where small and fibroblastic cells occur. Myeloid cells none. A little fibrin where the fibroblasts are seen. No necroses or tubercular nodes. A very little scattered pigment near trabeculae.

Diagnosis: Hodgkin's Disease of the Reed type without necroses and at the cellular or very early fibrotic stage. (Fig. 1).

Upon the establishment of this diagnosis radiation treatment was started and during the next thirteen days the patient received one complete series of cross fire, and direct application of radium to thoracic, axillary and inguinal regions. At first the glands enlarged slightly, the skin thickened and a decided febrile reaction was observed. Pleural fluid became embarrassing so that it was removed mechanically only to reaccumulate, but after a second thoracentesis it remained at a minimum. After several exposures a decided improvement began and the patient left the hospital much improved. Reports one year later indicated that under x-ray therapy the improvement had continued. Just before discharge a gland was removed beside the scar of the first adenectomy. Its examination revealed the following:

(535) Gland removed after two weeks of treatment consists of a firm, pale yellow, fairly well outlined homogeneous mass.

Under the microscope it consists of about 80 per cent of hyaline acellular connective tissue which does not give the amyloid reaction. It cannot be recognized as a gland nor can parts such as capsule, trabeculae, follicles and so forth be made out. It does not seem that this connective tissue is especially distributed about blood vessels. Between the coarse strands of the hyaline connective tissue are elliptical, fairly well stained nuclei and some that take the stain less well. The latter seem like connective tissue nuclei, the former lymphoid in nature. Here and there are cellular groups ill outlined from the fibrous tissue which sends strands in among them.

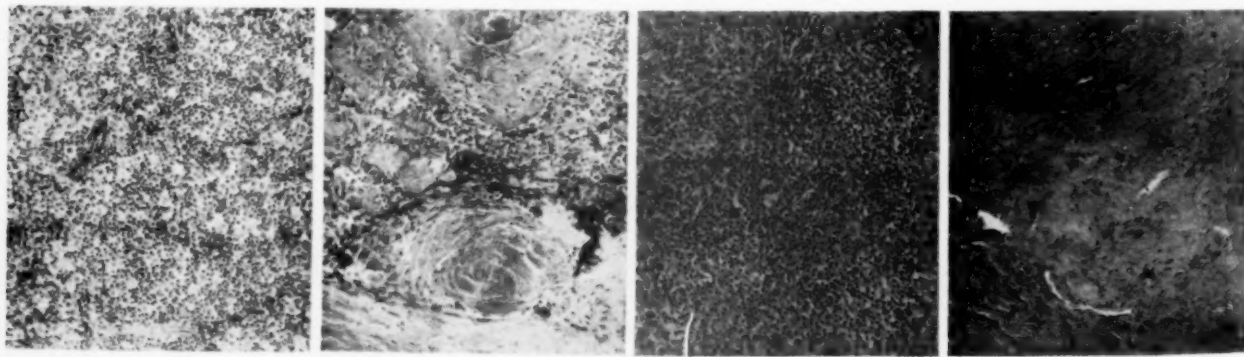


Fig. 1—Case I—A. E. No. 514: Hodgkin's disease in the cellular stage.

Fig. 2—Case II—A. F. No. 535: Section of a gland adjoining No. 514, but after two weeks daily x-ray treatment. Total absence of large mononuclears, fibrous tissue increase, no eosinophiles. Fig. 3—Case II—P. P. No. 516: First adenectomy. Nonspecific inflammation and hyperplasia of lymph node. Not typical

Hodgkin's disease. Numerous large mononuclears, but not so-called Reed type.

Fig. 4—Case II—P. P. No. 544: Section of lymph node adjacent to that shown in No. 516, but after ten days daily x-ray exposures. Absence of large mononuclears. Almost entirely fibroblastic tissue. Rifts indicate position of marginal sinus.

These groups are made up of very well stained small and middle sized lymphoid cells and a moderate number of middle sized mononuclears of vesicular character which seem like swollen reticulum cells. This latter impression is gained especially where cellular areas are looser and have the general structure of lymph sinuses with rather delicate trabeculation. On the whole it would seem as if follicle or chordal areas have been very largely removed, only a few indefinite strands of lymphocytes remaining in and about structures which look like sinuses. Here and there one sees a very large nucleus like the giant Hodgkin's nucleus but compared to the original section they are practically reduced 99 per cent; these are the only endothelioid cells encountered. Here and there are one or two polynuclears. A little brownish pigment is seen in fine granular form both in connective tissue and cellular masses. No plasma, mast, eosinophile, myeloid or true giant cells, No fibrin, necroses or tubercles. Elastic tissue shows in blood vessel walls and a few strands in the capsule. (Fig. 2).

Case II: This case has been reported by us in the Medical Clinics of North American, December 1921, as one of Sternberg's tuberculous pseudoleukemia. The superficial region lymph nodes were never conspicuous whereas evidences of mediastinal and abdominal masses existed all during the course of the disease. With the hope of explaining these lesions a diagnostic adenectomy was performed with the following findings:

(516) Section seems like that from about half of a gland. The major part of the capsule is missing; the remaining part seems to be the cellular internal layer. This layer contains deeply stained cells of the lymphatic series, and a few elongated deeply stained fibroblastic cells. Not many trabeculae are found, those present being rather loose and not followed by sinuses. Marginal sinus is apparently squeezed closed and is not indicated by any definite layer of cells. Where it surely can be recognized it is open. Follicles as such do not exist but here and there are small, rather loose groups of lymphocytes. Chords and sinuses are not easily distinguished. Venous sinuses are indicated in places and surrounded by fairly prominent endothelial cells. Where sinus can be assumed there is a remnant of the reticulum. The hilum is not present so its vessels cannot be definitely described. Large ones present show about normal walls. In them and in the veins the blood shows a predominance of mononuclear cells,

One large central vein found distended and surrounded by a very delicate fibrocellular wall. The general gland is made up of an irregularly grouped mass of chord and sinus-like arrangements in which the cells are large, small and middle sized, deeply staining mononuclears with a small amount of cytoplasm. Here and there one will see a large endothelioid cell apparently in a sinus or on the margin thereof. One seen was distinctly phagocytic of cells, granules and red blood cells. A few of these cells have two nuclei, some have a very distinct vesicular nucleus. In the connective tissue and along chords some of the nuclei are vesicular and elongated. One fair sized hemorrhage was seen. Pigment here and there, delicate granules, chiefly free. Few plasma cells, polynuclears a few, and irregularly scattered. No definite granular eosinophiles found. A few large cells seen with distinct oxyphilic protoplasm. Some of the large cells mentioned above have a rather deeply stained nucleus and cytoplasm suggesting myeloid cells more than endothelioid cells; they are not granular, therefore, like promyeloids. Giant cells only of the granular multiple type as mentioned above. In one area there is some advancing fibrosis as indicated by grouping of the connective tissue nuclei. No necroses or tubercular nodes. (Fig. 3).

This seems more like chronic lymphadenitis than anything else but the extinction of the follicles and the appearance of rather numerous large endothelioid cells make a diagnosis of atypical Hodgkin's disease possible although the absence of necroses, eosinophiles, groups of large cells and ringed nuclei speak rather against such a diagnosis.

Treatment was begun on the basis of its being Hodgkin's disease, giving in ten days a series of cross fire and surface exposures at multiple points according to H. K. Pancoast's technique but this, instead of helping the patient's condition, appeared to aggravate it, especially the mediastinal mass. A second adenectomy at the expiration of this series, the gland being taken near the site of the first one, revealed the following:

Sharply outlined tough white mass recognizable with difficulty, if at all, as a gland. Section shows a wide, densely fibrous, partly hyalin capsule from which no distinct trabeculae penetrate the mass. It is separate from the internal parts. On the margin of the split, probably the marginal sinus, are a few elongated deeply stained nuclei. The bulk of the mass is made up of adult hyalin connective tissue in the splits of which are a moderate

number of small lymphoid cells and of moderate sized vesicular nuclei. Cells probably do not occupy more than one-tenth of the square area. Where they are grouped more abundantly the same kinds of nuclei are seen. The blood vessels are small, well surrounded by hyalin connective tissue. There are also many young capillaries. Very small amount of fine granular pigment near the capsule. Follicles, sinuses, chords not distinguishable. No endothelioid, mast, eosinophile, polynuclear, myeloid or giant cells. Here and there a plasma cell. No fibrin, necroses, or tubercles. Elastic tissue found in blood vessels and a few strands in capsule. (Fig. 4).

Temporary improvement followed the cessation of x-rays but upon resumption relapse was again observed. Autopsy revealed acute miliary tuberculosis of many organs and lympho-granulomatous tumors of lymph nodes, liver and spleen. These latter tumors were of the type described by Sternberg.

Case III: A. P. a Polish boy aged 10 years gave a history of enlarged glands of neck for two years, fluctuating in size both spontaneously and under treatment. For a while they remained limited to one side, but later the other side and axilla became involved. Mediastinal mass was existent but not extensive. Spleen was easily palpable throughout nearly the entire course of observation until very recently. No direct evidence of personal tuberculosis existed, skin tests also being negative, but father and two uncles had this disease. During the year previous to entering the University Hospital a few treatments with x-ray had been given but it was impossible to ascertain the details. No treatments seem to have occurred within the last six months. First adenectomy revealed the following histology:

(556) Section is surrounded by a young fibrocellular capsule which lies almost directly upon a fibrocellular mass not recognizable as lymph node and separated only in a few places by rifts probably remnants of the marginal sinus. Trabeculae are very indefinite since there are so many irregular bands of connective tissue (see below). Follicles as such are not present but there are some indefinite groups of adult lymphocytes, possibly

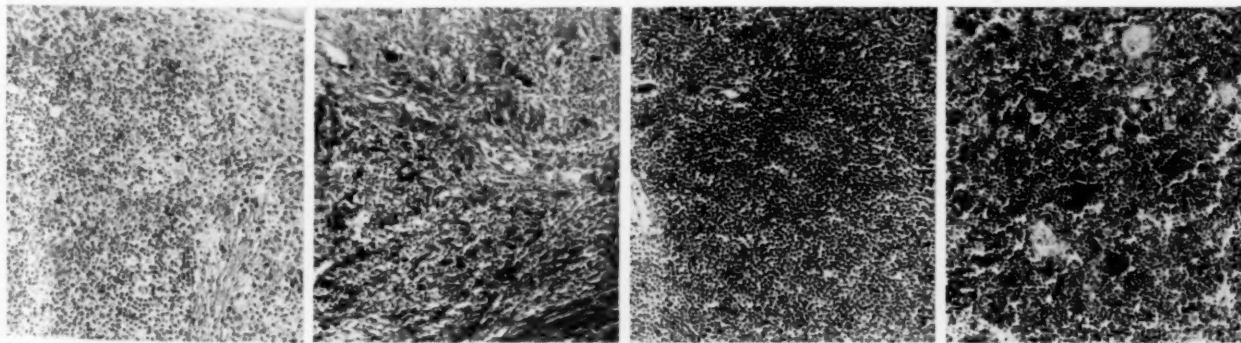


Fig. 5—Case III—A. P. No. 556: First adenectomy. Active Hodgkin's disease of two years standing with fine diffuse fibrosis and moderate eosinophilia. Had a few x-ray exposures several months before this gland was excised.

Fig. 6—Case III—A. P. No. 577: Gland adjoining that shown in No. 556 after two weeks daily x-ray treatment. Disappearance of large mononuclears and eosinophiles. Coarse fibrosis not especially perivascular. Small mononuclears somewhat larger and with more protoplasm.

Fig. 7—Case IV—S. O. No. 552: Adenectomy. Uniform hyperplasia of lymph node diagnosed as leukemic hyperplasia. Case aleukemic. Cells 7 to 10 microns.

joining No. 552 four weeks later, but after ten successive days x-ray treatment and four days of pneumonia. Note appearance Fig. 8—Case IV—S. O. No. 573: Postmortem gland. Gland adjoining No. 552. Small mononuclears the same size.

the remains thereof. Chords are indistinct, probably made up largely of adult lymphocytes. A few sinuses can be made out with fair distinctness and contain swollen lymphocytes and endothelioid cells with single or multiple nuclei; no reticulum. Hilum vessels are large, walls proper are thin but with considerable connective tissue around them. Internal vessels are numerous, lining cells flat, and fibrous tissue rather hyalin. Connective tissue is everywhere increased. In the cellular areas it is young with a moderate number of small vesicular nuclei but where there is any collection of fibers it immediately becomes hyalin. This hyalin connective tissue really occupies nearly one-third of the general structure of the mass in one section and considerable in the other section. The cellular areas consist of about 67 per cent adult mononuclears and an equal number of swollen mononuclears, swollen reticulum cells, very large endothelioid cells and eosinophiles. The large endothelial cells are of the usual type and in the cellular masses are not in lacunae, whereas in what seems to be sinuses there is a rather definite lacunar space about them. On the whole they are rather well mixed with the swollen reticulum cells and the lymphocytes. Their protoplasm seems rather distinctly acidophilic. Multiple and ringed nuclei are common and some of them are quite deeply stained. Polynuclears are infrequent and single. Eosinophiles are very numerous, particularly in the cell groups. They are mostly mononuclear but there are a few with two equal nuclei. Giant cells only of the Hodgkin's type, not Langhan's, no myelocytes, necroses, tubercles or pigment. Plasma cells moderately numerous in the fibrotic areas.

By polychrome stain practically no granular cells are seen except eosinophiles whose granules are quite small. The very largest cells are divisible into those with a distinct granuloid basophilic protoplasm, thus reminding one of the description of Sternberg, and a rarefied protoplasm with very faint basophilic quality. A few of them show no stain at all. There seem to be gradations in these cells. No mast cells found. A few cells in lacunae seem to have more definite granules but they also seem to be dividing. (Fig. 5).

This case was diagnosed Hodgkin's disease of the fibrous, sclerosing variety with the reservation that in the face of a distinct tuberculous history and certain cellular elements comparable to Sternberg's descriptions, it might be an atypical lymphatic tuberculosis. The boy was treated as if he had Hodgkin's disease, receiving

ten daily exposures before a second adenectomy was performed, a gland being removed next to the scar of the first operation. The exposures were as strong as the skin would endure, by cross fire and surface application. This boy has continued under the charge of the roentgenologist for nearly two years, receiving nine series of treatment whenever slight enlargements were noted. He is doing very well. The second adenectomy revealed the following histology:

(577) Much periglandular fibrosis. Mass hard, cuts with resistance, surface streaked with fibrous bands between which is a hard gelatinous substance. No necroses or hemorrhages. Section shows an extremely wide hyalin capsule and the section area consists of practically 75 per cent of hyalin connective tissue. Cells are almost exclusively of the lymphoid type but are separated by fine fibrosis. There are a few swollen reticulum nuclei, and one endothelioid cell was found, having, as in 556, a tendency to acidophilic staining of its cytoplasm. A few plasma cells seen, no mast, eosinophile, neutrophile, myeloid or giant cells. No fibrin, necrosis, tubercles or pigment.

Stain for elastic tissue shows it in blood vessel walls, in the capsule, and the coarser trabeculae; not in the fine fibrous tissue.

Fibrous tissue stain, Van Gieson, shows it dense and hyalin both in coarse and fine areas. (Fig. 6).

Case IV: This patient, a man of 60, had had isolated, firm, painless nodules in neck for a year and a half with the more recent development of similar masses in the axillae and groins. This case was reported by us in the American Journal of Medical Sciences for March, 1922, as an example of aleukemic leukemia or systemic lymphomatosis. The peculiarities in this case were the fluctuation in size of the cervical glands when treatment was started for diseased tonsils and carious teeth, the apparent general well-being of the man throughout most of his illness (although toward the time he was admitted some failure of general health was observed) and the absence of enlargement of the mediastinal glands and of the spleen. Throughout

the whole course of observation the leukocyte count was very low, 6,500 being the maximum. During the x-ray treatment these cells dropped to 3,300 per cubic millimeter. Nor did they rise during the terminal pneumonia. Hodgkin's disease was the first diagnosis but this was corrected by the study of an excised gland.

(552) Gland from neck about 2.5 by 2 cm. Smooth, pale pink capsule which is thin and uniform on section. Mass is pale gray-pink, homogeneous, soft, not traversed by fibrous bands. Section consists of rather uniformly staining mass fairly well outlined by delicate capsule, outside of and within the splits of which are cellular infiltrates. The marginal sinus cannot be recognized. Node seems to be of a single type of cell separated by a few delicate connective tissue strands carrying blood vessels and cut at different angles. The cells vary from 7 to 11 microns, the nuclei from 5 to 9. The nuclei are fairly well stained, have a clear but delicate nuclear net work. The protoplasm is neutrophilic with here and there a slightly oxyphilic example. They are mostly round or elliptical but some compressed ones are seen. Here and there one will see what seems to be a true young connective tissue nucleus. By Van Gieson's stain the capsule and delicate septa show clearly but there are no fibers between the cells. A polychrome stain (only fairly satisfactory) shows no true granules of the myeloid type but here and there one finds pictures like azure granules. By this stain a polynuclear eosinophile was seen and large mononuclears of large endotheliocyte proportions were found and these have distinct vesicular nuclei and a purple cytoplasm, very distinct from the scanty neutrophilic protoplasm of the average cell of the section. One eosinophilic mononuclear was found. Schridde stain reveals no real perinuclear granules and here and there one sees masses of irregularly staining and granulated appearance and also masses or matter which might correspond to the above mentioned azure granules. Section showed no oxidase granules by Graham's method. (Fig. 7).

Roentgen ray treatment was given in one complete series over all bones and the neck for a period of twelve days. Exposure to cold and draught during one of the last trips to the x-ray laboratory resulted in a pneumonia from which the man died in four days. At autopsy a gland was

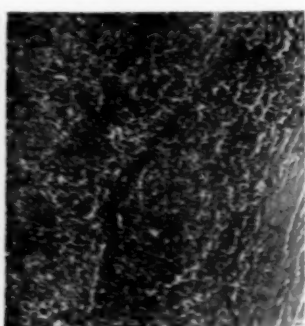
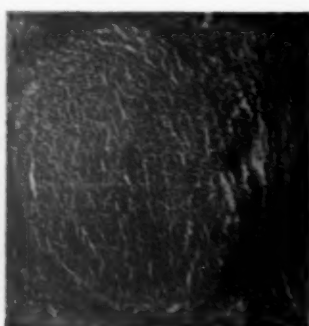
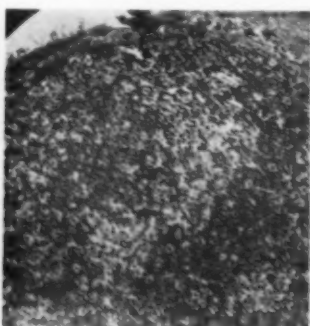
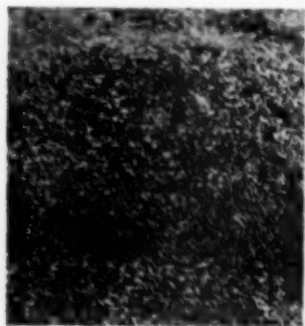


Fig. 9—Case V—S. G. No. 592: First adenectomy. Section of lymph node in a case of mycosis fungoides or of cutaneous leukemia. Solid lymphoid hyperplasia with a very few small lightly stained reticulum cells.

Fig. 10—Case V—S. G. No. 634: Second adenectomy. Section of lymph node in same case as No. 592 after three weeks x-ray treatment run in a series over the entire body. Lymph cells same type as No. 592, but much greater prominence of the lightly stained cells.

Fig. 11—Case VI—P. P.: Dr. Talley et al, Presbyterian Hospital. Lymphadenopathy of rather short duration as discrete

mass in neck and axillae. Principal type of cell like young lymphocyte, about nine microns. Partly successful attempt at retention of lymph gland architecture. Most like a leukemic hyperplasia of lymph nodes.

Fig. 12—Case VI—P. P.: Dr. Talley et al, Presbyterian Hospital. Second adenectomy after nine months intermittent roentgen therapy. Destruction of all architecture, increase of coarse fibrosis, no fine intercellular fibrosis. Tissue to be looked upon as a leukemic hyperplasia affected by x-ray or as reticulum sarcoma.

removed from beside the scar of the diagnostic adenectomy. The autopsy revealed leukemic hyperplasia of all lymph nodes including a large tumorous swelling of the retroperitoneal group and of the spleen, and an infiltration of the liver; the cause of death was a fibrinous pneumonia and early plastic pleuritis. The gland removed at autopsy revealed the following:

(573) After x-ray small, soft, rather doughy, well encapsulated homogeneous deep pink gland, section surface of which swells. Fairly well outlined mass. Not recognizable as lymph node. Connective tissue around it is hyalin and fairly well delimited from the cellular mass. The mass consists almost exclusively of cells of the small lymphoid type with barely visible protoplasm. They are irregularly arranged but fairly solid. In the interstices are large numbers of singly disposed endothelioid cells. Fibroblasts are not visible, capillaries are very numerous, their walls being made of flat endothelia and a small amount of fibrous tissue. The mass resembles the original gland in its solid state but the principle cells are smaller and the numerous endothelia in lacunae present a new feature. There is no fibrosis. (Fig. 8).

Case V was one upon which some uncertainty existed as to exact terminology but it surely belongs in the groups usually called granuloma fungoides or leukemia cutis. A male Italian of 42 gave a history of pruritis of six years standing. Over the areas in which this had existed for some eight months the skin became dry, scaly and fissured. Three months before the present treatment, separate painless enlargements of lymph nodes were observed in the inguinal regions. Examination of the man reveals a dusky red, fissured, exceedingly dry skin, covered with scales except on the palms and soles. Discrete glands were found in the neck, axilla and groins and some under skin of the trunk, spleen is much enlarged. Leukocytes on admission were 25,000 of which 43 per cent were polynuclears, 52 per cent small lymphocytes, 3 per cent large mononuclears and 2 per cent eosinophiles. The total count later rose to 30,500 with 60 per cent of small mononuclears and 30 per cent of polynuclears; there was, therefore, a low grade mononucleosis or sub-lymphemic state. A diagnostic adenectomy coincidentally with this blood count showed the following:

(592) Section of tissue well encapsulated by a narrow but adult connective tissue capsule. The general architecture like that of lymph node but all cellular features are exaggerated. Marginal sinus for the most part is open but in some places crowded with small lymphocytes. The trabeculae are adult fibrous tissue containing in places many mononuclears and a few polynuclears. The gland is made up of follicular and chord-like groups of lymph cells between which there are single, grouped and strand-like sections of very large mononuclears of the endothelial type. Some follicles are solidly lymphoid. Others contain a very large germ center in which, however, there is about an even mixture of large and

small mononuclears. Chords are solidly lymphoid. The sinus linings cannot be made out clearly because these spaces are crowded with large and small mononuclears and melt into the edge of the chords. Reticulum both in sinuses and between the cells is very scanty. Lymphocytes are nearly all adult. Reticulum cells inconspicuous but nuclei larger than normal. Endothelioid cells quite prominent along the edge of chords and in sinuses but marked in follicular or chordal areas. Plasma cells few. Mast cells and eosinophiles absent. Polynuclears, moderate number especially along trabeculae. No giant cells and few large multinuclear cells with pale nuclei. No fibrin, necrosis, tubercles or pigment. Vessels around capsules quite large and contain many leucocytes almost entirely of the mononuclear variety. Leukemic hyperplasia of lymph node. (Fig. 9).

A piece of skin removed at the same time showed lesions similar to those described for leukemia cutis. The patient was treated by x-ray receiving in twenty-three days two series of one-third the usual leukemia dose over entire body. A week after the last exposure another gland was removed. During treatment at the University Hospital a noticeable reduction occurred in the size of the spleen and regional nodes and the pruritis and redness were much improved. He was then discharged because of misconduct, but has since been in charge of other roentgenological laboratories.

(634) Lymph node from abdominal wall after one-third erythema dose six days, interval eleven days and again six days of x-ray treatment, based on diagnosis of cutaneous leukemia or mycosis fungoides. Section looks like solid lymph node but division into marginal and medullary areas not clear. Capsule is adult fibrous, in places becoming hyalin. Marginal sinus is for the most part pressed shut but can be seen here and there as a rift without cells or reticulum. Trabeculae small, delicate, adult. Follicles consist of a narrow rim of small mononuclears and a large central area of middle sized mononuclears smaller than the average endothelioid cell, a few eosinophiles, no central vessel. The mass of the gland is made up of irregularly disposed lymphoid tissue in which sinuses and chords

are not distinct from one another. The parts which might be called chords are solidly lymphoid, with a few quite large mononuclears and a rather coarse reticulum. Scattered in this lymphoid tissue are mononuclears mostly single, a few in groups not unlike the cells of 573. Here and there small areas of pale staining may be found as if the cells at this point were dying. There is, however, no pyknosis or karyorrhexis. Some of these areas are in follicular centers. Reticulum cells inconspicuous. Lymphocytes all adult, a very few plasma cells and eosinophiles. No mast, myeloid, giant cells, fibrin, necrosis, or tubercles. Small amount of golden brown pigment in the looser areas suggestive of sinuses. Blood vessels few, small arterioles. Lymphatic hyperplasia of lymph node. (Fig. 10).

Case VI is the first to be received from Dr. Talley, Dr. Newcomet and Dr. Eiman of the Presbyterian Hospital. A male of early middle life was admitted with discrete glands in neck and axilla ranging from a very small size to that of a hen's egg. Spleen very slightly increased in size. No change in mediastinum. A diagnosis of Hodgkin's disease was made but this could not be confirmed by the results of a diagnostic adenectomy which were as follows:

(5655) Section consists of tissue which can be recognized as a lymph node because of the fibrous capsule and trabeculae, and an attempt to retain follicle markings. Capsule is wide, fibrous, as are the trabeculae. In places a marginal sinus can be made out containing small mononuclears and red cells. Follicles are large accumulations of large sized small mononuclears of about uniform diameter without a tightly packed marginal zone. By reason of this enormous increase of follicular size, chords are not clear although suggested between nearby follicles. Sinuses are pressed shut and where they can be made out seem lacking in reticulum. The fine reticulum in follicles and chords is difficult to detect. A few endothelioid cells are present here and there in the follicles, and suggest swollen reticulum cells. The lymphocytes are of the type classed as young and measure about nine microns. Here and there some cells suggest the plasma type, but this is rare. No eosinophiles or myeloid cells, giant cells,

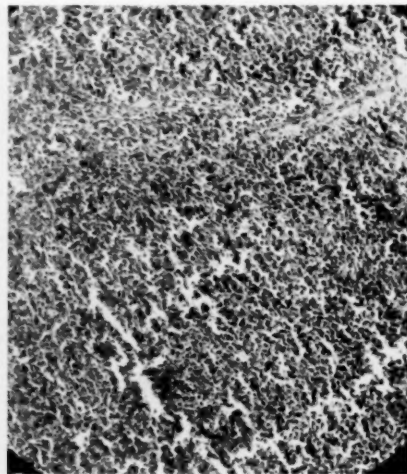
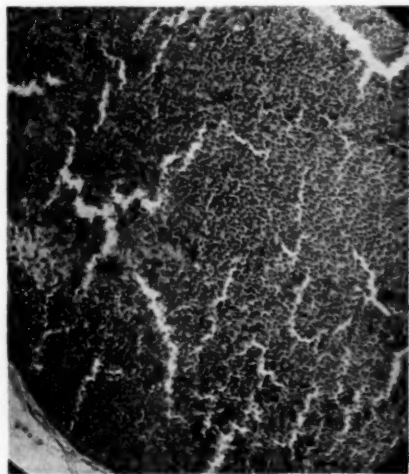


Fig. 13—Case VII—J. K.: Dr. Hamill et al, Presbyterian Hospital. First adenectomy. Rapidly growing lymphatic tumor made of medium sized cells with fine intracellular reticulum. Loss of architecture. Diagnosed as lymphosarcoma. Fig. 14—Case VII—J. K.: Dr. Hamill et al, Presbyterian Hospital. Second Adenectomy. Many degenerated and vacuolated cells. Some spindle shaped cells. Fibrosis between cells and in coarse strands increased. This was removed after two series of x-ray treatments directed to the area from which the gland was removed.

fibrin, necrosis, tubercles or pigment. (Fig. 11). This is, according to our classification, a leukemic hyperplasia.

Roentgen ray treatment was carried out by giving 13 series during nine months, of which seven directly reached the area from which the second gland was removed. The tumors receded in size in axillae and neck but those in chest and abdomen (which developed during the nine months) did not respond to radiation. Dr. Newcomet thought that this was sarcoma because of the reduction of size of tumors directly rayed. Condition becoming worse by reason of symptoms of nervous system involvement, patient was readmitted to hospital and another gland removed. At this time separate small tumors could be detected all over body especially in the left lower abdomen, but not in mediastinum (?). Blood counts were within normal limits except that polynuclears were relatively low. Autopsy by Dr. Eiman is reported as follows:

Lymphosarcoma primary in neck, metastases to mediastinum, pleura, retroperitoneal region, pelvis, mesenteric glands, liver, lungs, spleen, R. adrenal, L. kidney; producing obstruction to thoracic duct and R. ureter; chronic parenchymatous myocarditis with dilatation; atrophy of R. adrenal; R. hydronephrosis, hemorrhagic cystitis, chylous effusion in both pleural sacs and in peritoneal space. The important individual features of the autopsy were as follows: No skin lesions. Apparently principal tumor was in neck. Mesenteric and pelvic glands involved in large mass. Individual masses in liver. Diffuse infiltrate in spleen. No apparent involvement of spinal chord. Glands as a rule were discrete. No degenerations.

The second gland to be removed gave the following result to histological study:

(6300) Section consists of a mass of cellular tissue traversed by fibrous bands, the whole not being recognizable as a lymph node. On one side is some condensation of fibrous tissue which may have been a capsule but its strands are here and there separated by cellular infiltrations. The main mass of this section consists of regularly dispersed cells with here and there a small blood vessel which acts as a sort of incomplete septum. Between the cells no fibers are perceptible in the hematoxylin and eosin stain. The cells of this tissue are very mixed, and it is difficult to state which type, if any, predominates. There are small deeply staining lymphocytes and there are larger cells of similar character and a few plasma cells. There are many large deeply staining nuclei with abundant protoplasm. There are polygonal cells. There are a few multinucleated cells but practically no polynuclears, eosinophiles or giant cells. The fibrous strands which pass irregularly through the outer parts of this tissue are wide adult fibrous tissue, in some places hyalin. The small amount of connective tissue that may be seen near blood vessels within the main cellular mass is also adult and may be hyalin. (Fig. 12).

A very satisfying explanation and nomenclature of this second gland is not easy to obtain. At first sight it would seem like a reticulum sarcoma because of the absence of an intracellular fibrosis (then indicating that

the first gland did not represent what the second gland did or that the whole process had changed) but it may be on the other hand merely a modification of the original leukemic hyperplasia under the influence of radiation. The case surely progressed as though it were sarcoma and the pathologist believed that an original sarcomatous tumor was localized in the neck.

Case VII was another case from the Presbyterian Hospital, under the care of Dr. Hamill, Dr. Newcomet and Dr. Eiman. It was a boy of six who had suffered for only two weeks before admission, however, with enlarged cervical glands; these had followed pain in the chest of two weeks duration. Glands were found in all parts of the body as discrete, soft, movable, painless masses. Spleen was enlarged but not so the liver. Mediastinum contained a definite mass. First diagnostic adenectomy showed the following:

(8088) Section consists of cellular mass surrounded by a very delicate capsule. It resembles hyperplastic lymph node, but cannot be certainly identified as the same. The finely fibrillar capsule lies directly upon the cellular masses. No trabeculae. Follicles are suggested by very large groups of mononuclears, of about nine microns, separated from one another by condensed strands of cells of the same type. The nuclei are not deeply stained and show a rather indistinct chromatin net work. Between the cells in all positions is a delicate reticulum. Chords and sinuses not certainly distinguished. Vessels are few and have thin walls. The hilum is slightly fibrotic. A very small number of swollen reticulum nuclei are found. A small hemorrhage was found and a few scattered granules of pigment. No other varieties of cells discovered.

This seems like a well advanced leukemic hyperplasia, but the persistence of a fine reticulum, and its apparent increase suggests that the condition approaches lymphosarcoma; there is, however, rather too much retention of the architecture to make this latter diagnosis absolute. (Fig. 13).

Because of the suggestion of sarcoma of lymphatic tissue, Coley's fluid and x-ray were used. Neither had much effect and death took place five months from the first signs. There was during the course of the case a moderate anemia and a leukocyte count varying from 9,600 to 13,000 but with a very uncertain differential picture; at no time was the differential count indicative of leukemia. The irradiation treatment was in five series during five weeks, of which four antedated the second adenectomy and two played directly upon its area. The treatment was not satisfactory and no distinct improvement in size of glands or general condition resulted. The second gland removed revealed the following under the microscope:

(8209) Section cannot be recognized as lymph node. Capsule definite adult fibrous tissue, hyalin in places with considerable adult fibrosis in trabeculae and at the region which might be the hilum. The rest of the tissue consists of a mixture of two types of cells

separated by some connective tissue, fibers in rather coarse strands when viewed under the high power. These two types of cells are as follows: A roughly round cell with deeply staining, round nucleus and a generous supply of acid-staining protoplasm; some of these cells seem vacuolated. The other type of cell is elongated with a rather indistinct nucleus running longitudinally to the cell and of the same shape. These cells tend to run in strands. Here and there small blood vessels may be seen some of which are obliterated. (Fig. 14).

This tissue like the second specimen from Case VI is difficult to name but it seems like a sarcoma affected by the rays in that fibrosis has increased and certain cells have degenerated while others are being stimulated into activity.

The autopsy done by Dr. Eiman was noted as showing sarcomatosis. Its peculiar features were:

Discrete enlargements of lymph nodes. Notes indicate that enlargements in mediastinum and abdomen are of discrete but adherent glands except in mesentery which is a large confluent mass. Section surface soft, bulges, homogeneous, yellow-white, no necroses. In liver discrete nodules and what seem to be infiltrates. Spleen almost replaced by confluent nodules. Infiltration in lungs.

SUMMARY

There are recorded in this article the outlines of seven cases of lymphadenopathy composed of the following diagnoses: One case of Hodgkin's disease in the cellular stage, one case diagnosed as Sternberg's pseudo-leukemic tuberculosis, one case with great similarity to this last disease but classed as sclerosing Hodgkin's disease, a case of aleukemic leukemia or systemic lymphomatosis, a case of leukemia cutis with sublymphemic blood, one of aleukemic leukemia or reticulum sarcoma and one of lymphosarcoma. These diagnoses are made on the basis of a classification used by Dr. Farley and myself and now in press (*Am. J. Med. Sci.*). The present work was not undertaken as a support for this classification but naturally it was hoped that additional criteria would help to confirm the correctness of the system on which it was based. This has been achieved only to an extent consistent with previously recognized classifications, in reference to the separation of the Hodgkin's and allied diseases from aleukemic leukemia and the decided difference between the leukemic hyperplasias and those of a more neoplastic nature.

The figures are photographs of the best fields obtainable to represent the majority of the principal characters of the sections. They were taken with the same machine, and excepting cases VI and VII, with the same magnification; these two are a very little lower in enlargement because representative fields did not remain clear for both slides of each under the higher power. The magnifications are

close enough to be comparable throughout.

Strict comparison of the effect of x-ray cannot be made throughout the seven cases because of the different durations of the individual instances, the character of treatment it was possible to administer and the length of such treatment. The seven cases, however, fall into three groups about which some general observations are permissible. The effects of irradiation as summarized on an earlier page are confirmed by these cases. The lymph cell and its congeners are definitely reduced while the endothelial and fibrous tissue cells instead of being limited in production, seem definitely stimulated to multiplication. It is also very certainly demonstrated that there is no return to normal architecture in glands under the action of x-ray and radium. There is greater evidence of phagocytosis by large cells with vesicular nuclei in tissues that have been rayed than in those removed before treatment.

The first group that can be made from our cases includes numbers I, II and III, instances of lymphogranuloma, one a distinct Hodgkin's disease and two suggestive of a tuberculous origin. Under the influence of x-ray and radium the degree of fibrosis is the most conspicuous feature but the practical disappearance of large endothelioid and Reed cells is certainly definite. The fibrosis appears in strands and in what were possibly follicular areas, not necessarily perivascular, although sometimes around vessels, but more in places where one would expect to find numerous elongated, swollen, elliptical nuclei. The lymph cells of adult proportions disappeared almost entirely in Cases II and III while in number I they remained in small groups or scattered singly. In Case III large forms approaching lymphoblastic proportion were to be seen. The reaction as a whole resembles somewhat the coarse and deforming fibrosis to be seen in late stages of tumor-forming Hodgkin's disease and might be described as an accelerated natural course of events. Since no return to normal occurs and an unnatural gland is still existent, we cannot forbear to comment that perhaps the wisest course in all cases of Hodgkin's disease is to remove surgically all accessible tumor tissue.

The second group includes Cases IV and V, which although differing radically in a clinical sense present tissue with many similarities both before and after x-ray treatment. Their principal resemblance consists of the uniformity with which the lymph cell is the dominant feature of the hyperplasia. Neither case was frankly

leukemic from a clinical standpoint although No. V was suggestively sublymphemic for a time. The effect of the treatment given those two patients was to reduce the number of small mononuclears in the lymph nodes but there was no essential change in the anatomy of the individual cells. More striking, however, is the greater visibility of the large mononuclear cells after x-ray. (Contrast Figs. 7 and 8, 9 and 10). It is believed that these cells are actually increased in number but it may be that it is a reduction of the small cells which makes them more conspicuous. An attempt at counting them in comparable fields was not satisfactory although more were counted in the treated gland. Vascularity is greater after treatment. Fibrosis, however, is not at all a prominent feature of the microscopical sections of these particular glands; even fine perivascular, intercellular and capsular connective tissue increase is missing.

The last two cases fall together in some respects and are radically different in others. To our view Case VI has some resemblance to Case IV but was of course a much more rapidly progressive disease. Because of the early attempts at the retention of nodal architecture we place it in or near the leukemic hyperplasias, although it must be admitted that in gross pathological behavior the disease bore some resemblance to sarcoma. The effect of longer development of the process and of x-ray treatment was to destroy all normal relations, to induce a coarse fibrosis and to change the type of cell to one of irregular proportions and staining properties and to make some of them degenerate.

Case VII was certainly of rapid sarcoma-like character. In this instance the primarily nearly homogeneous cellular picture was changed by x-ray into one in which degenerated cells were mixed with actively growing individuals resembling spindly sarcoma elements and the fibrosis was increased in strands and between units.

It may be added at this point that obliterative thrombosis so commonly described as one of the effects of radiotherapy was not a notable occurrence in any of our sections. Indeed in Cases IV and V there seemed to be a larger number of small vessels after than before the treatment.

We do not wish to draw final conclusions upon the action of roentgen rays on lymphadenopathies from these seven observations. This is, however, a considerable amount of material, since reasons for repeated adenectomy are not often at hand. We would, however, draw concluding attention to certain features which have stood out prominently in our material. The first

of these is the character of fibroses in lymphogranuloma and the disappearance of the large endothelioid cells in this process. The swollen reticulum and endothelioid cells of the leukemic hyperplasias as illustrated by Cases IV and V, are not reduced, but made more visible, possibly by increase in number. The anatomy of the lymphocytes in these two cases was not appreciably altered by x-ray but their number was reduced. In the lesions suggesting sarcoma as in Cases VI and VII where endothelioid cells do not appear prominently in the original picture they do not become more visible with x-ray treatment. The principal cells of these tumor-like cases are greatly changed under x-ray both in arrangement and individual character. Fibrosis in the lympho-granulomatous varieties is much more voluminous than in the leukemic and neoplastic. Fibrosis does not seem to increase between the cells after treatment when it has not been present in this location before radiation. The statement made by other writers and repeated in an earlier paragraph that normal architecture does not return in an abnormal lymph node under the action of roentgen rays is fully confirmed by the descriptions and photographs.

The bearing that these findings have upon the classification from which the diagnostic names were taken is simple and limited. The lymphogranulomatous processes, whether truly tuberculous or of the Hodgkin's variety, belong together and their reaction to x-ray is distinctly different from that of the leukemic and neoplastic hyperplasias. Between the latter two there are also essential differences notably in the behavior of large endothelioid cells but the particulate elements of neoplastic hyperplasias are much more susceptible to change of anatomy than are those of the leukemic growths. Tumor cells degenerate readily and completely alter their shape, while lymphoblastic cells retain nearly normal proportions and may vary little or none in staining qualities. The reasons given in these last few sentences may offer further criteria for a systematic classification.

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The Value of Oblique Films in the Study of the Thorax*

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THE posterior thoracic territory with its borders and contents does not receive the same degree of study as the more accessible parts of the chest. The fact that the posterior mediastinum is more difficult to visualize and that abnormalities occur with less frequency in this secluded field may account in some measure for the neglect.

Anterior stereoscopic impressions fail to reveal that extensive thoracic area which contains the mediastinal spaces and contents. During the past eight years it has been our rule to combine the fluoroscopic and posteroanterior stereoscopic studies with that of the physical examination and clinical evidence before giving an opinion on the condition of the thoracic contents. Recently it was realized that the above method of examination left many cases of thoracic disturbances unexplained. This led to a more frequent use of the oblique film in order to visualize the posterior mediastinum.

Our appreciation of the value of exposing the oblique plane of the thorax is due to the work of Evans, of Detroit, in which he demonstrated the importance of this method in the diagnosis of tracheal bronchial adenopathy in children. In his series it was not uncommon to find children with lung roots which appeared practically normal when studied in the anterior dimension, but which showed signs of frank enlargement of the posterior bronchial glands when the oblique films were examined. This observation led us to adopt as a routine procedure the use of oblique chest films in all radiographic studies of children.

Pfahler has helped us in demonstrating the value of this method in locating and estimating the extent of substernal goiters, while in the routine examination of the esophagus and dorsal spine the method is universally employed. European observers, especially Vaquez, have also called attention to the good results obtained by the study of the oblique diameter of the thorax. Yet this plane is seldom investigated unless some abnormality in the anterior observation suggests an oblique view or some important evidence found in the patient's history stimulates further search for an etiological factor. We feel, therefore, if a chest is worthy of x-ray study, that

such study should include a film of the oblique plane as a routine measure, and that the adoption of such a method would reveal many frank abnormalities hitherto unsuspected. This is particularly true of the arch and descending portion of the aorta.

What constitutes x-ray evidence of a pathological aorta? Some observers feel that a distinctly outlined aortic shadow on oblique position must be considered as abnormal. This may be worthy of consideration when only the screen is used, but aortic impressions recorded by radiographic oblique films are, in our opinion, not necessarily a sign of abnormality or disease. Was it not considered, at one time in the recent past, that a definite outline of the kidney was evidence of disease? Now failure to secure a frank density is considered a sign of poor technique. More recently the visualized gall-bladder has been accepted by many radiologists as a distinct sign of pathology. Is it not true that other keen students in interpretation disagree with such a view, attributing the definite outline of the biliary reservoir to proficiency on the part of the technician? In our earlier experience we were inclined to consider a shadow formed by the descending portion of the arch as a sign of atheroma, whether or not calcareous deposits were discernible. The finding of many cases in which a uniform, evenly distributed image of the aorta was seen, especially in some healthy children, led to modification of this view.

Irregularities in shadow density, we think, should be taken as more definite evidence of the abnormal. Before the thoracic aorta can be considered pathological, careful consideration must be given to the age, weight, height and build of the patient. The normal arch curve in the oblique position varies under these circumstances. The intensity of shadow would naturally increase with the age of the subject. After all is considered, it is difficult to estimate size, width, or density by definite measurements. Orthodiagrammatic oblique plates are some times of use in obtaining a more accurate estimation of the size of the aorta, but this procedure takes time and in only a few instances is it worth the effort. The presence or absence of pathology in the aorta must be estimated by signs of distinct departure from a reasonable normal. The estimation of what constitutes normal and abnormal must be decided

by the radiologist whose duty it is to settle such questions in clinical x-ray.

Oblique plates are indispensable in the study of mediastinal tumors, disease or enlargement of the glands (bronchial, thyroid or thymus) or the location of foreign bodies in the bronchi. Many observers feel that a fluoroscopic study is sufficient and that such a method has the additional advantage of detecting the presence or absence of pulsations, thereby differentiating to some extent between circulatory abnormalities and tumors. Our experience has convinced us that both procedures are necessary. The oblique film will reveal delicate destructions and boundaries which the screen in turn fails to distinguish. Pulsations in masses of tumors may be transmitted from adjacent circulatory tissue and tend to confusion. The permanent record of the film for continued study and future comparison is further proof that both the film and the screen are necessary in investigating the posterior portions of the thorax. The inclusion of oblique films as part of the routine radiographic study of the thorax in about eight hundred cases examined during the past few months led to the belief that this procedure should form a part of all thorough observations of the thorax and contents.

The technique is simple; a right oblique can easily be obtained by placing the right chest to the film, but the angle must be accurately caught to allow little or no sign of the pulmonary tissue to be seen on the opposite side of the spine. A preliminary screen study is often necessary to get the exact angle. Special measuring devices have been invented, but we have found little difficulty in estimating the proper position in which to place the patient.

The following cases illustrate the importance of permanent oblique impressions of the thoracic cavity:

Case I: Mrs. S., aged 68, has enjoyed good health until three years ago, when she began having a slight productive cough, accompanied by occasional wheezing dyspnea and suffocation. During the summer months these symptoms subsided. For the past year, however, there has been a persistent pain in the back of the neck and the interscapular region, accompanied by a definite numbness in the lower limbs. The patient is nervous and complains of a light feeling under the sternum. There are no signs of tenderness in the interscapular area.

*—Read at the Annual Meeting of the Radiological Society of North America, Detroit, December 7, 1922.



Fig. 1—No cardiac hypertrophy. Aortic arch apparently only moderately enlarged for patient of 68 years of age.



Fig. 2—Shows an oblique view of Figure 1. A very definite aneurismal enlargement of the descending aorta.



Fig. 3—A very extensive aneurism of the arch and upper thoracic aorta.

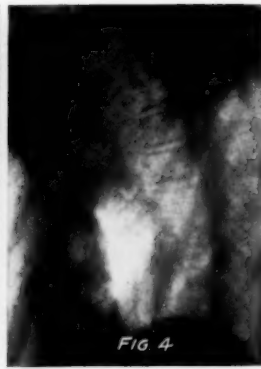


Fig. 4—An oblique view of Figure 3, showing atrophy of the bodies of the third and fourth dorsal vertebrae from persistent pressure of the aneurismal sac.

The physical examination shows no definite abnormality. Nutrition and development are good, considering the patient's age. Blood Wassermann, negative. Recent mucopurulent expectoration showed no acid-fast bacilli.

In the stereoradiograms (Fig. 1) each pulmonary base showed indistinct, hazy markings characteristic of a chronic venous congestion. No cardiac enlargement was found and the aortic arch was not definitely widened. The right oblique film of the thorax (Fig. 2) showed a round bulging enlargement of the lower thoracic aorta, characteristic of an aneurysm. The bronchitis and dyspnea could thus be easily explained. The posterior-anterior stereoradiograms did not show any abnormality, while the fluoroscope showed only an ill-defined mass in the posterior mediastinum.

Case II: Mr. L., aged 62, for the past six months has complained of pain in the back, localized in the interscapular region. This has been associated with a loss of 25 pounds in weight and a definite persistent cough with watery, mucoid expectoration. In the latter no tubercle bacilli were found. Blood Wassermann, four plus.

The stereographic film (Fig. 3) shows no cardiac enlargement, but the upper portion of the aorta, including the arch, forms a huge rounded dilatation with the definite earmarks of an aneurysm. The right oblique film (Fig.

4) shows this large aneurysm to be limited to the upper half of the thoracic aorta, but it also shows a distinct atrophy of the bodies of the third and fourth dorsal vertebrae from the persistent pressure of the aneurysmal sac. In this case the oblique film of the thorax was necessary to find the osseous atrophy, and thus the probable cause of the interscapular pain was found.

Case III: H. R., female child of 12 years (Fig. 5). Previous history: pneumonia at five months, measles, mumps, whooping cough and chicken-

pox in childhood. At present ten pounds under weight. A right oblique film of the chest shows a definite aortic shadow which if pathological is unusual at this age.

Case IV: Mr. F., anterior chest stereoscopic films show a moderate enlargement of the lung root zones, while the oblique (Fig. 6) brings into view a clean cut nest of hypertrophied glandular tissue in all probability accounting for the cause of a chronic persistent non-productive cough, heretofore unaccounted for.



Fig. 5—Right oblique view of the thorax in the case of a child of 12 years of age. Note the definite shadow caused by the aortic arch.



Fig. 6—An oblique view revealing hypertrophied glandular tissue in the posterior mediastinum. The anterior view in this case revealed no abnormality.



The Roentgen Analysis of the Right Diaphragm*

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MY ATTENTION has been attracted to this subject through the demand of clinicians for information upon lesions with obscure or overlapping clinical signs of disease at, above or below the diaphragm upon the right side. The right diaphragm seems to present more clinical demands but less difficulty in diagnostic radiological analysis. The diaphragm is a true border-line between the thorax and the abdomen.

The confusion of symptoms and clinical evidence at the right diaphragm is as truly a border-line condition as ever existed at political border-lines. Parenthetically, one might engage in an imaginative synchronistic politico-pathologic analogy of the subject. As this analysis proceeds, imagine—if you please—that the diaphragm is the Mason and Dixon Line with the solid hepatic South below; the free-breathing pulmonary North above, airing its opinions to the stolid South steeped in its own comfortable slavistic torpidity. Between them the well-defined line of demarcation, a political diaphragm. Naturally those people in direct contact to this border-line must be in constant turmoil, political congestion and border-warfare. John Brown at Harper's Ferry with his underground tunnel is the lymphatic pathway of exchange. Enough of this personality of disease. One must engage your serious attention to cold scientific facts—if such there be.

This analysis of the right diaphragm: radiologically speaking, offers the following points of interest:

1. The Normal Diaphragm:
Anatomy, shadow contour, excursion.
2. The Pathologic Diaphragm:
Contours, movement, excursion, variation, thymic equation.
3. The Concomitant Movement of the Lower Ribs.
4. Specific Pathologic Conditions:
Diaphragmatic Hernia
Eventration
Paralysis.
5. Sub-Diaphragmatic Pathologic Condition:
a. Sub-phrenic abscess.
b. Hepatic abscess, tumor, cyst.
c. Abdominal ascites, leukemia, ovarian cyst, hydronephrosis.
6. Supra-Diaphragmatic Pathologic Conditions:

Pleurisy
Pneumonia—acute and unresolved
Pericarditis
Bronchitis and Bronchiectasis
Pulmonary abscess.

7. Pathologic States with Diaphragmatic Signs and Symptoms but No Direct Pathologic Contact.
8. Accessory Diagnostic Devices:
Pneumoperitoneum
Thoracoscopy
Pneumothorax.

9. Roentgen Consultation at the Bed-side.
10. Foreign Bodies.

THE NORMAL DIAPHRAGM

The most astute observer and literary searcher can find no more adequate descriptions of diaphragmatic activity under radiologic control than those produced by Francis Williams¹ to whom we pay homage tonight. It was indeed a pleasure to me when I discovered that my studies, which naturally included his original text-book, would probably provoke his discussion as an original observer of diaphragmatic movement. How thrilling it must have been to Doctor Williams to first actually see a diaphragm rise and fall when before he had only heard it rise and fall with his tappings. The ecstasy and wonder of the pioneer observer is not often given to a physician. But Dr. Williams saw the advantages of the roentgen ray in clinical pulmonology and blazed a trail which has since been laid in concrete fact by succeeding radiologists upon his original surveys.

Normal diaphragmatic action consists in a synchronous rise and fall of the diaphragmatic shadows which are almost parallel, except for the fact that the left diaphragm makes a measurably deeper excursion than the right. The excursion of the right leaf is about 1.7 cm. and the left 1.5 cm. with quiet breathing. The excursion between full expiration and inspiration is 6 to 8 cm. upon the right and 7.1 cm. upon the left side. These are Williams' figures. They have not been altered by later orthodiagraphic measurements or subsequent studies. These are reliable figures for the average sthenic chest. The hypersthenic chest will have a short chest with greater convexity of the diaphragms with less average excursion but greater potential excursion by voluntary deep breathing. The hyposthenic patient will have a longer chest with dia-

phragms of less convexity, approaching a triangular line to the chest wall, with very shallow excursion and less potential excursion by forced respiration; in fact, the hyposthenic, enteroptotic patient will frequently present no excursion of the diaphragm upon demand, as they breathe with the upper thorax.

The angles of the right diaphragm shadows are acute at the cardiophrenic zone and at the costophrenic zone. They are always acute in all three types of habitus, but the degree of acuteness varies, to-wit: the hypersthenic type is more acute than the sthenic and the hyposthenic is less acute, being almost 45 degrees at times. This variation in acuteness in the different types of stature or habitus must be observed when attempting pathologic analysis. For instance, an acute costophrenic angle with marked convexity of the diaphragm in a hyposthenic habitus spells pathologic significance. The dimensions of the chest do not determine the variations, but the habitus of the individual does.

Both diaphragms seem to move in unison with an even, smooth convex curvature and with the right diaphragm higher than the left. There can be two or more waves observable in the right diaphragm without pathological significance due to uneven contraction of muscle bundles of this fan-shaped muscle. In the absence of clinical symptoms referable to the right phrenic area, these waves should be disregarded. They are interesting evanescent observations but of not great pathologic importance and may be seen at one examination, only to vanish in succeeding observations. When, however, there is an angle developed with an apex toward the lung, normality has ceased. This tent-like shadow will be discussed thoroughly later.

The flattening of the diaphragm with inspiration and descent depends greatly upon the expansion of the lower rib arch and the habitus of the subject. The hyposthenic type exhibits a persisting flatness or lack of convexity which is only a concomitant of a toneless, flaccid diaphragmatic muscle. The hypersthenic type has a very convex diaphragm shadow which only flattens slightly by the expansion of the costal arches in their abdominal type of respiration.

THE PATHOLOGIC DIAPHRAGM

Every intrinsic pathologic state of the muscle, nerves and coverings of the diaphragm as well as specific lesions

*—Read at the Annual Meeting of the Radiological Society of North America, Detroit, Dec. 8, 1922.

above and below this border-line, influences its roentgen silhouette and movement. Cardiac pathology changes the phrenic angles and movements. Pulmonary lesions, acute and chronic, contiguous and distant, alter the mobility and contour. Spastic disturbances such as hiccough, sneezing, vomiting, tetanus, hydrophobia and poisoning offer graphic disturbances of outline which are of no clinical value. Chronic fibrotic changes in the lungs and pleura afford compensating disturbances of the phrenic outline which are deforming but only pathologic remnants.

The fact remains that there may be complete loss of activity of one side of the diaphragm without death or even without serious interference with livable existence. Paralysis, eventration, congenital absence, complete fixation of one diaphragm may occur and the other diaphragm and the intercostal muscles will afford compensatingly increased activity. But if both diaphragms are paralyzed or destroyed, death occurs. The diaphragm muscles are vitally concerned in the inflation of the lower lobes of the lungs and atelectasis of one lower lobe may occur with loss of activity of one diaphragm but if both diaphragms are paralyzed, as in post-diphtheric cases, massive collapse of the lower lobes of both lungs occurs with dissolution.

Inversion of the diaphragm, producing an abdominal tumor, may occur as a complication in extensive pleural effusion. If the pressure of the increasing pleural fluid completely collapses a lung and continues to develop, it must force the diaphragm to inversion. Riesman² submits an interesting case report upon this rare condition.

The diaphragm maintains its neutral position by its muscular tonicity. It is constantly harassed by positive intra-abdominal pressure and negative intra-thoracic pressure. Any interference with these normal pressures serves to disturb the phrenic position. For instance, ascites forces the diaphragm up and lessens the excursion, sometimes to nil. Emphysema forces the diaphragm down and decreases its excursion. Pleurisy with effusion, depresses the diaphragm and may completely limit its activity. Pleural base adhesions tend to fix the phrenic excursion in keeping with their extent, strength, and cicatricial characteristics.

Irregularities of the diaphragm were found in four per cent of 3,754 soldiers followed through their service at Camp Lewis by Ralph Matson³. He takes exception to the usual decision that the tented appearance of the right or left diaphragm is caused by pleural adhesions. These tented deformities, not curves or waves, may appear and dis-

appear thus showing the non-persistence of actual adhesions. Matson theorizes that these pseudo-adhesions are the result of the negative intra-thoracic pressure pulling the diaphragm by suction into a dimple of lung tissue which resists expansion by reason of bronchial involvement. The diaphragm really conforms to the base of the lung in normal breathing. The lung follows the diaphragm in excursion but the negative intrathoracic pressure demands that the diaphragm conform to the contour of the lung base. The shadows of the bronchi seem to pass into the apex of such a tented phrenic outline. When the bronchitis clears up and there is normal flexibility of the lung base, these tent-line irregularities disappear. Asthenic types with atrophied or toneless phrenic muscle display this phenomenon more readily. Matson offers excellent experimental proof of his theory.

The thymic child demands a correlative study of the diaphragm. One must watch the thymus at the phrenic phases of inspiration and expiration. Gerstenberger⁴ shows the necessity of studying the appearance of the elephant ear shadow of the thymus at expiration and its vanishment into the heart shadow upon inspiration. We have carried out this procedure for some time in connection with observations upon the erectile characteristics of thymic tissue. It is a neat point for further study and standardization.

Anatomical studies of the diaphragm bring out the points that the diaphragm is not a single muscle upon either side but that there is the crural portion acting mesially and the parietal portion acting parietally or laterally. The diaphragm is in constant opposition to the intercostal muscles which serve to raise the arches of the ribs while the diaphragm pulls the anterior costal margins slightly inward. J. C. and G. Briscoe⁵ afford some exhaustive anatomico-pathological articles. Thomas⁶ speaks of the frequently observed phenomenon of a division of the right diaphragm shadow into a rounded median arc against the cardiac shadow and a flattened lateral arc. We have frequently observed this and without applicable pathologic significance. Thomas explains this by the greater length of the phrenic muscle bundles from the eighth and ninth ribs and weakness of the median and anterior muscle bundles. Reduction of negative intra-thoracic pressure favors the appearance of the arc, just as the diaphragm ascends in paralysis or relaxation diaphragmatica, otherwise, eventration. "The reduction of thoracic pressure is increased, hence the arching during inspiration in pathologic

conditions that restrict expansion, such as stenosis of trachea or bronchi, atelectasis, shrinkage, gangrene, etc." This arching does not indicate specific disease. It may be purely muscular.

THE CONCOMITANT MOVEMENT OF COSTAL MARGIN

It behooves the radiologist to use clinical facts to assist his interpretation of shadow-values. The movements of the costal arch laterally and the anterior subcostal angle or margin inward are functions of the intercostal musculature during respiration. Hoover⁷ calls our attention to the values of such clinical observations and many reporters upon eventration, vs. hernia diaphragmatica, have based their differential clinical diagnosis upon these facts without radiologic assistance. A brief analysis of Hoover's clinical article gives us this outline:

1. The costal margin *moves outward*, symmetrically, in paralysis of the diaphragm, following diphtheria or poliomyelitis.

2. The costal margin *moves inward* toward median line (a) with paralysis of the intercostals following cord injuries to the cervical and upper dorsal vertebrae and (b) in flattening of the diaphragm due to emphysema, bronchiectatic spasm, asthma.

3. Costal margin *moves to one side more than other* with accentuation of arch of the diaphragm, in acute diseases of the liver, subphrenic abscess and impairment of diaphragm. The only supraphrenic condition offering this action is massive collapse of the lung. The differential sign between massive collapse of lung and subphrenic abscess is displacement of heart and lung to right in massive collapse. Case history is demanded where fibroid changes of pleura are exhibited.

4. The costal margin moving toward median line means that the diaphragm has gained the mastery and the diaphragm therefore is depressed; the intercostal musculature is paralyzed and the rib arch fails to move, i.e., pneumo-thorax, large pleural effusions and positive intra-thoracic pressure.

In a combination of pyopneumo-thorax and subphrenic abscess all these signs fail.

With peritoneal tuberculosis, Foerster⁸ reports a flattening of the phrenic convexity and obliteration of the costo-phrenic angle, bilateral elevation and decreased excursion. This is almost a similar picture to what we have seen in ascites. Foerster further states that if these shadow values are unilateral they mean paranephritis and that cholecystitis, pyelitis and appendicitis produce no phrenic alterations. Pan-

coast⁹ has reported the elevation of the left diaphragm with fixation in perinephritic abscess, with this further satisfying observation that when the patient was shaken quickly in lateral direction a wave of fluid was visible. In a second case Pancoast was unable to reproduce these signs in the recumbent posture of the patient.

Such observations as the above require an analytical interpretation. The splash of level of stomach contents could be confused with Pancoast's shadow values. Upon the right side, the liver density would interfere in vertical fluoroscopy and as Pancoast says, the signs do not register in the recumbent position of the patient.

SPECIFIC PATHOLOGIC CONDITIONS

Diaphragmatic Hernia. The roentgen reports upon this are voluminous. They seemed to crash down all at once. Almost no journal went to press without a case report. Inasmuch as this is usually a left-sided condition we will not proceed carelessly. Quite naturally a defect can occur anywhere in either phrenic leaf with a congenital or traumatic origin. The x-ray opaque meal examination is universally admitted by radiologists and Philistines as the proof of the condition.

The recent war produced many cases of traumatic phrenic hernia. English literature especially is replete with excellent case reports. The general distribution and accessibility of roentgen apparatus accounts for the surge of reports of hernia diaphragmatica of congenital and acquired types. Many of these reports frankly admit the diagnostic conclusiveness of roentgen examinations, while others magnanimously or grudgingly include the roentgen findings as corroborative evidence.

Diaphragmatic hernia may be congenital or traumatic in origin. The congenital type does not always give symptoms until some trauma forces the attention, if the patient lives to adult life. Many still-born children have large diaphragmatic defects. The condition usually occurs upon the left side, although Eppinger found 21 right-sided cases among 74 studied. The symptoms seem to depend upon the size of the defect or upon subsequent trauma. Hernia diaphragmatica is more often confused with eventration or relaxation diaphragmatica.

The roentgen findings of diaphragmatic hernia include (1) an abnormal contour and arching of the affected diaphragm; (2) irregularity of the arch; (3) with lung shadows visible through the gas-filled abdominal organs above the diaphragm shadows; and (4) the opaquely-filled viscera are discovered in the thorax above the diaphragm; (5) the movement of the af-

ected diaphragm offers no characteristic shadow-values as this probably depends upon the extent of the defect and the size of the hernial sac; (6) the roentgen findings may vary in extent due to temporary reduction of the hernia and fluctuation of the visceral contents of the hernial sac.

Eventration of the diaphragm consists in the relaxation and elevation of a phrenic leaf with concomitant higher position of the normal abdominal viscera below the particular leaf. Synonymous terms are insufficiency, relaxation, dilatation, elevation, etc. The roentgen findings include (1) the high position of the diaphragmatic dome with (2) a smooth contour and (3) no gas shadows of abdominal viscera above; (4) the movement of the diaphragm is paradoxical, that is, upon inspiration the diaphragm ascends and upon expiration it descends.

Confusion may arise from the elevated position of the diaphragm due to old pleuritic adhesions, but the irregularity and fixation of these shadow values should be sufficient to discriminate easily. Over 90 per cent of cases are left-sided. It is usually congenital and rarely gives symptoms which originate intrinsically. It is discovered because of other disease or because of disease in the displaced viscera. It is easily confused with pneumothorax, clinically, because of the tympanitic note produced by the hollow abdominal viscera thus displaced; but this confusion is not transmitted to the roentgen findings, which are remarkably satisfying.

Paralysis of the diaphragm may be unilateral or bilateral. When unilateral it is usually the result of trauma to phrenic nerves. When bilateral it is of central origin, frequently the case in diphtheria. The position of the diaphragmatic domes is always high. They offer no movement or traction and therefore, the intercostal muscles gain mastery and pull costal arches sharply outward with paradoxical displacement of diaphragm shadow. There may be atelectatic changes in the adjacent lung tissue. In bilateral diphtheritic paralysis, massive collapse of the lower lobes occurs.

Probably I have not given sufficient space to the discussion of paralysis. There is certainly a massive literature. But it seems that if the condition is bilateral from disease or injury the case rarely occasions roentgen consultation, and if unilateral the symptoms are not severe and there is no demand for roentgen study. Our only confusion is eventration and the conditions seem almost identical, radiographically and clinically, excepting that eventration is

usually congenital and paralysis is acquired.

SUB-DIAPHRAGMATIC PATHOLOGICAL CONDITIONS

Abdominal Ascites, Etc. Let us dispose of the gross abdominal enlargements such as ascites, leukemia and ovarian cyst briefly, inasmuch as they only serve to displace the right diaphragm upward by pressure against the liver, with these conditions the left diaphragm does not seem to be displaced upward because the right side rises so much more easily. This presupposes normal phrenic musculature. Contrary to the apparent force of an enlarged spleen upon the left diaphragm, one notes that the spleen extends downwards, displaces the stomach outline to the right and seems to rotate the left abdominal contents with the clock toward the liver and thus eventually displays its force by elevating the right diaphragm. This phenomenon is of little practical value and always of minor importance.

Hepatic Lesions of intrinsic origin, such as cyst, abscess, angioma and tumor have little influence upon the right diaphragmatic outline unless they are at the superior margin and this is rare. With them, the excursion of the phrenic leaf is lessened and if there is inflammatory invasion of the phrenic reflections of the peritoneum, this border muscle exhibits spasm (hiccough) or painful movement (asthma). Our personal experience indicates that these intrinsic lesions produce more shadow values upon the gastric contour than upon the diaphragm, with the one exception of an isolated hepatic abscess producing a bulging of the phrenic leaf corresponding to its superior contour.

Subphrenic Abscess: The roentgen analysis of this condition is usually concerned in eliminating or proving the presence or absence of pathology above the diaphragm, either as a primary or complicating pathological condition. This is a real border-line disease. It is the condition that prompts all that I have said before and all that I may be permitted to say hereinafter. It seems that there is no great difference between the clinical symptoms of pathological disturbance immediately above or below the diaphragm. Without the clinical history or the surgical sequence of complications, there is very little difference in the symptomatic and phonetic display of a basal pleurisy with slight effusion and subphrenic abscess. But the supra-phrenic condition holds the diaphragm fixed or pushes it downward, while the subphrenic abscess pushes the diaphragm up and fixes it.

Therein lies the efficiency of roentgen analysis. And therein also lies the difficulty. Right here, the roentgenolo-

gist becomes a diagnostic hero or an evasive coward. Here rests the decision of love at first sight with a roentgen analysis of excruciating service to the patient or of executing damage to the subsequent history of the case. A vacillating roentgen reading is of no value here. The demands of the case are uncompromising. The roentgenologist must know his fundamentals, read his shadow values without bias or sympathy and then stick by his guns, right or wrong. Thus equipped he will be right 90 per cent of the time, and God knows there is a human equation of fallibility.

What are the complications above and below this border line muscle which make for symptomatic confusion? Above, they are pleurisy and pneumonia; below, they are subphrenic abscess and hepatic abscess and general peritonitis.

What primary lesion precedes this diagnostic dilemma? Usually an appendicitis (postoperative) or a perforating duodenal or gastric ulcer; rarely, thoracic pathologic conditions. Certain combined statistics (Maydh, Gruneisen, Perutz-Gusted by Norris and Landis¹⁰) show intra-thoracic origin in 18 out of 448 cases.

No attempt will be made to describe the pathological anatomy or symptoms. There are many excellent surgical papers of recent origin which are sufficient. We are concerned with the more or less simple roentgen shadow values or silhouettes which define an infection as above or below the borderline muscle—the diaphragm. The x-ray findings are usually so simple and exact that they do not seem sufficient, but they really are. The fault usually rests with the vacillating roentgenologist who wavers in the face of diagnostic victory; who hesitates when he should charge the ramparts of symptomatic indecision; who neglects his opportunities to establish his ability at roentgen interpretation.

To me there are two areas in the body where failure to stand by one's diagnostic guns spells ignominious defeat. The one is brain abscess, the other is subphrenic abscess. He who hesitates is lost. I would rather be right than president. I would rather be wrong than vacillating with the winds of conjecture.

The roentgen findings of subphrenic abscess demand a high diaphragm, well-domed, upon the right side with fixation or extremely limited restriction of movement. A preceding abdominal infection or perforation serves to fortify the diagnostic importance of these roentgen signs. The presence of pleural reaction, even with effusion, does not

change the values of the above shadow-values.

More intimate analysis of these gross characteristic shadows provides the disappearance of the costo-phrenic sulcus or angle because of the approximation of the phrenic leaf to the lateral chest wall as the phrenic dome ascends and fixes itself. The presence of an air bubble below the curved phrenic dome, which changes level with postural change, indicates the presence of gas and only fortifies the sub-phrenic nature of the conditions.

SUPRA-DIAPHRAGMATIC PATHOLOGIC CONDITIONS

These are numerous and will only be discussed briefly in their relation to diaphragm shadow values.

Pleurisy with effusion tends to fix the diaphragm, to obliterate the costo-phrenic space, and to present a concave upper margin which reaches higher at the periphery of the chest and only presents a fluid level if air is present. It only presses the diaphragm down when the pressure or fluid increases without extension of the upper pleural margins. The chronological sequence of pathological extension is easily depicted by roentgen examinations.

Pericardial effusions give triangular heart outlines with loss of acuteness of the cardiophrenic angles and loss of pulsation shadow to the heart outline.

Pneumonia shows the central opacity of the lung tissues, with or without the overlapping pleural reactions. The fixation of the contiguous diaphragm is a matter of propinquity.

PATHOLOGIC STATES WITHOUT CONTACT DISEASES

Paralysis has been described.

Spasm of clonic and tonic character: Clonic spasm includes hiccup and paroxysmal sneezing. Roentgenologically they are not as interesting as their origin. They will probably be of rare observation as time and prohibition wears on. Tonic spasm occurs in tetanus, hydrophobia and poisoning.

Tuberculosis of the apical areas provides a diaphragmatic restriction which has provoked endless discussion. Williams was the first to assert that the diaphragm of the affected side fails of an excursion equal to that of the healthy side. This has failed to obtain universal acceptance. It has been denied entirely by certain French observers. It is only appreciable by fluoroscopy. It is delicate. Undoubtedly, the rapid stereoscopic plates have forced attention away from this fluoroscopic finding.

Williams states, under the title of *Appearance of the Lungs Upon the Fluorescent Screen in Early Tubercu-*

losis, that "The apex of one lung is seen on the fluorescent screen to be darker than normal, owing to the increased density of this portion of the lung; and second, the excursion of the diaphragm is seen to be restricted on the affected side, and usually in the lower part of its excursion."

The difficulty seems to be one of meticulous roentgen observation. The pathological foundation for this sign has ample support, but its universal appreciation has been tardy. Perhaps it is a matter of education as well as observation. It is certainly easier to see this phenomenon than to attempt to percuss its presence. And yet many clinicians attempt to elicit this sign by percussion note and surface meeting. Crane¹¹ says: "The diaphragm is the vital barometer of the lungs, and may give the first signs of coming clouds above." Duken¹² states that Williams' sign does not hold with children. Wats-ham and Overend attempt to explain this sign by (1) pleuritic adhesions or (2) impairment of pulmonary elasticity or (3) reflex inhibition of muscular action by vagus irritation or (4) phrenic nerve involvement at apices.

Personally, I used to depend upon Williams' sign because I looked for it with the fluoroscope, but stereoscopic plates seem to dull my appreciation of its value at present. It always seemed to me that it was an early finding of nature's attempt to put a lame lung at rest—a sort of spastic splinting of the affected thorax. The persistence of the sign was affected by the lung becoming injured to the disease with a demand for compensatory air-space in the lower chest. In later stages the sign again manifested itself because of pleural adhesions and fixation. This sign surely requires further confirmation or refutation. Perhaps if we went back to fluoroscopy we would learn more about it. This sign of Williams is not lost to roentgenology. It is simply enjoying a recess while high-powered plates have their inning.

ACCESSORY DIAGNOSTIC DEVICES

Pneumoperitoneum is not without certain elements of danger. The analysis of the simple roentgen values should be sufficient. The distention of the abdomen with air could be harmful in diaphragmatic hernia and phrenic defect. Filling the viscera with air or opaque media is more to the point. The Trendelenburg position is useful in studying hernia and eventration.

Pneumothorax by artificial means may be of value in studying the adhesions at the diaphragm of old pleural origin.

Thoracoscopy offers highly specialized values of doubtful advantage.

These special adjuvant diagnostic procedures may serve those who are not grounded in clinical analysis of symptoms and the roentgen study of shadow values. They are not necessary to the careful student of disease.

In closing may I direct your attention again to the paragraphs upon subphrenic abscess, for these are my principal arguments—the diagnostic milk in the cocoanut—the stuff that roentgen heroes are made of.

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Gall-Bladder Disease with Special Reference to Fluoroscopic Findings*

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A SURVEY of the literature does not throw much light on the interpretation or value of the fluoroscopic findings of the pathological bladder. It is true that mention is made of the so-called "indirect findings" basing these usually on fluoroscopy substantiated by plates, but as a whole there seems to be a universal attempt to discredit this method. It is difficult to appreciate why the fluoroscopic findings of a penetrating ulcer of the stomach, of such size and so located that it can be seen without any difficulty, or the fluoroscopic findings of a pneumothorax, etc., should not have the same interpretive value as a plate or film. Applied to gall-bladder disease these findings may not be so marked, yet why question the importance of definite fluoroscopic signs that properly interpreted may mean as much and in some instances more than plates? I freely admit, fully appreciate, and do not underestimate the valuable work of George, Kirklin, Pfahler and others as to the conclusiveness of the gall-bladder outline, when shown, being practically pathognomonic of a diseased gall-bladder, yet I question the converse, that failure to show a gall-bladder shadow on a plate signifies the absence of a pathology of this organ.

In a very recent publication the author makes this statement: "Fluoroscopy has been of no practical value in this line of work, in fact in some ways it has seemed an actual detriment to the perfection of gall-bladder diagnosis. Except by remote, indirect methods, there is nothing within the power of the fluoroscope to give the

least information regarding the pathological gall-bladder." It seems fluoroscopy is condemned by a number of writers even though their so-called "indirect findings," obtained from the plates, are the direct findings of the fluoroscope.

It is my belief that the fluoroscopy has a very definite and decided place and value. Many times when the findings in the plate were negative I have seen the indication of a pathological gall-bladder shown in the fluoroscope. On the other hand, I have found the reverse equally true, the percentage being in favor of the plate. Again, the routine use of the fluoroscope assures us of the absence of gross gastric or duodenal lesions. The point I desire to make is the proper correlation of the fluoroscopic findings to the ultimate roentgen conclusions.

In order to cover the subject I have arbitrarily divided the findings under six headings, which will be considered in order: (1) Stomach; (2) Bulbus Duodeni; (3) Duodenum and its behavior beyond the cap; (4) Fixation and pathological immobilization; (5) Localization of tender points; (6) Differential diagnosis.

STOMACH

In checking over a large series of patients there seems to be nothing in the fluoroscopic examination of the stomach to warrant the drawing of any definite conclusions. The peristalsis does not appear to be of any characteristic type, except in those few cases of pyloric or duodenal obstructions due to abnormal and infrequent ligamentous adhesions of the gall-bladder. In this event it is quite obvious that a malignancy or ulcer must be differentiated from a simple cholecystitis or a cholecystolithiasis. Patients afflicted

with gall-bladder disease usually have a very large Magen Blasse, swallowing and belching continuously, complaining of gas pain, due to "gas in the stomach," even though very little or no gas is present.

The presence or absence of fluid has no special significance, as this occurs so frequently in other conditions. A peculiar indirect sign often found present is the feeling of fullness which these patients complain of simultaneously with the appearance of the barium meal in the duodenum. A positive sign is the presence of a gall-bladder seat in the greater curvature of the antrum. This might be seen in either the upright or prone posture with or without rotation under the fluoroscope, the guidance of which has been of tremendous value in properly directing the central ray for plate exposure with the patient in the correct position to bring out this pressure seat to the best advantage just as in ulcer.

BULBUS DUODENI

The bulbus duodeni has been reported as becoming very large and dilated in gall-bladder disease, failing to empty as rapidly as a normal cap. This does not seem to hold true except in few instances, as many normal cases have been observed to do likewise, this varying with the gastro-intestinal tonicity. A bulbar defect when observed may well be considered at this point and if smooth and concave, a typical gall-bladder seat, it can readily be recognized with as much certainty as in a plate. It is found usually pressing into the outer border, although, the gall-bladder may press into the inner border, or even the upper. On several occasions the fundus of the gall-bladder has been noted lying across the bulbus duodeni producing a defect entirely across the

*—Read at Midyear Meeting of the Radiological Society of North America, St. Louis, May 19, 1922.

lumen of the cap, showing as a bilateral dominal musculature. All this combines to make it impossible to determine the mobility or immobility of these parts so that even if the duodenum is plastered down by pericholecystic adhesions unless there is a gall-bladder seat present, the fluoroscopic findings are worthless. In all other types of patient, fixation of the duodenum against the under surface of the liver, pulling of the stomach to the right with pyloric fixation, abnormal angulation of the duodenal arch, squaring of the upper margin of the bulb by traction with a full stomach, either in the upright or prone posture, usually means a pathological gall-bladder. These findings even in the absence of a gall-bladder shadow in the serial plates are very significant and have a definite and decided value.

Postoperative pathology such as adhesions, following a pyloroplasty, cholecystotomy, duodenal ulcer, etc., may increase the difficulties of fluoroscopy to such a point as to render all findings practically worthless.

DUODENUM AND ITS BEHAVIOR BEYOND THE CAP

The changes in the second and third duodenal segments and the behavior of the barium meal in the intestine at this point has, to me, taken on a very significant aspect. Normally when the barium meal passes out of the bulb of the duodenum, it passes readily and quickly through the second, third and fourth duodenal segments, into the jejunum. In gall-bladder disease this changes, the duodenum being usually somewhat dilated. The opaque meal shows a pronounced stasis, and the barium is regurgitated to and fro in the second and third segments and frequently even empties back into the bulb. This phenomenon may be observed in both the upright or prone positions, care being taken that there is no spinal pressure, constricting the duodenal lumen, when the patient is in the latter position. It is at the time especially that patients so frequently complain of that feeling of fullness. At operation duodenal dilatation usually is substantiated, not very pronounced, yet definite. Pathologically this peculiar behavior is due to a duodenitis, a common associated finding in gall-bladder disease, the barium acting in the duodenum just as it does in the colon in a colitis.

A gall-bladder seat may be demonstrated and often is in the duodenal arch, and this is just as definite a finding when demonstrated under the fluoroscope as when shown on a plate.

FIXATION AND PATHOLOGICAL IMMOBILIZATION

In all normal individuals, except the hypersthenic type, the pylorus, duodenum and hepatic flexure are freely mobile. In the hypersthenic individual with a hypersthenic or steer-horn stomach the pylorus is located far to the right and often directed posteriorly. The hepatic-duodenal ligament is also very short. These factors contribute to hold the pylorus and duodenum practically immobile. In addition the hypersthenic patient has a heavy ab-

dominal musculature. All this combines to make it impossible to determine the mobility or immobility of these parts so that even if the duodenum is plastered down by pericholecystic adhesions unless there is a gall-bladder seat present, the fluoroscopic findings are worthless. In all other types of patient, fixation of the duodenum against the under surface of the liver, pulling of the stomach to the right with pyloric fixation, abnormal angulation of the duodenal arch, squaring of the upper margin of the bulb by traction with a full stomach, either in the upright or prone posture, usually means a pathological gall-bladder. These findings even in the absence of a gall-bladder shadow in the serial plates are very significant and have a definite and decided value.

At 24 hours the hepatic flexure can usually be well outlined. Formerly the hepatic flexure as seen in the upright and supine position will show a considerable range of mobility. With adhesions present to the flexure it becomes drawn up under the costal arch against the liver. It is true that plates can also be used for this purpose, but it is much simpler and less expensive to observe this fluoroscopically. Again at 24 hours on numerous occasions, the appendix has been observed to be well filled and instead of occupying its usual normal anatomical position it was adherent against the under surface of the liver pulling the cecum up with it. It can readily be seen that with adhesions due to this condition, the entire hepatic flexure may be distorted and abnormally held. We have had five cases of this type during the past year.

LOCALIZATION OF TENDER POINTS

The localization of gall-bladder tenderness is certainly facilitated to the highest degree by the fluoroscope. Tenderness along the liver border which can be shown to be entirely outside of the gastro-intestinal tract certainly is highly suspicious of a pathological gall-bladder and frequent observations showing no encroachment of the gastro-intestinal tract upon the tender area can easily be made. Carrying these observations through for 24 hours and carefully observing the hepatic flexure one can again show the relation of this tender point to the colon. Should any portion of the gastro-intestinal tract overlie this area, then it requires differentiation between an intrinsic gastro-intestinal lesion or a gall-bladder.

DIFFERENTIAL DIAGNOSIS

Frequently a pathological gall-bladder must be differentiated from a pyloric or duodenal ulcer with or without adhesions, pyloric ulcer, gastric ulcer and pancreatitis by means of an opaque meal, fluoroscopy and serial

plates. Differentiation between a pathological right kidney or neoplasm of the hepatic flexure may require fluoroscopy and an opaque meal, enema and plates. Cardiovascular diseases, etc., can often be determined by the fluoroscope and plates. Fortunately in pyloric or duodenal ulcer, as a usual rule, there are few or no adhesions of the pylorus or duodenum. In pancreatic pathology a differential clue can frequently be obtained, when the head of the pancreas is involved and is enlarged causing the duodenum to take a wide outward swing to the right. Three such cases, however, proved to be the gall-bladder adherent to the head of the pancreas. Neoplasms of the hepatic flexure and a pathological appendix, abnormally fixed in the gall-bladder region, can be readily differentiated at 24 hours by fluoroscopic examination and by the use of the opaque enema. In case any stone shadow be present in the gall-bladder area, the shadow not presenting the characteristic gall stone outline but having a density that appears more like that of a renal stone, fluoroscopy will show this type of stone to be either in the gall-bladder or in the kidney. Lateral rotation will show this shadow to be either anterior or posterior, either in the gall-bladder or kidney area. Unfortunately this can be done in only a small percentage of cases.

In conclusion let me state that I do not advocate fluoroscopic methods in preference to serial plates and neither do I advocate serial plate methods entirely in preference to fluoroscopy. Do not misunderstand me. It is my firm conviction that the fluoroscope is of inestimable value in gall-bladder work and at least in our work, has often given the only sign indicating pathology of this viscus. This sign is that of duodenal stasis and dilatation. This sign may also be present in duodenal ulcer, pyloric ulcer, chronic appendix, colitis, arterio-mesenteric occlusion, ulcer of the duodenum beyond the bulb of the duodenum. A complete gastrointestinal examination should be made in every suspected gall-bladder and every gastrointestinal examination should include serial gall-bladder plates so that these previously mentioned lesions may be ruled out. Just as one clinical symptom may indicate the diagnosis, so one roentgen finding may indicate the correct diagnosis, whether it be by means of the fluoroscope or serial plates. It is not a question of methods, it is simply that of using every roentgen facility at our command for the benefit of the patient. Let me again repeat—the absence of a gall-bladder shadow in a series of plates does not necessarily imply that there is no pathology present.

Toxic Thyroid with Pathological Findings After Radium Treatment*

R. E. LOUCKS, M. D.

Detroit

IN THE clinical classification of toxic thyroid there are two distinct types—

Thyrotoxic adenoma

Exophthalmic goiter

It is a question whether simple adenoma of the thyroid may be caused by lack of iodine intake, calcium iodine balance, or by the parenchyma cells surrounding the alveolus being activated by some endocrinal stimulation. It may remain for years as a simple physiological enlargement, or it may become diffuse. The diffuse type utilizes the rest cells of Wolfner and with a hyperplasia of the stroma forms a new growth.

The symptoms of thyrotoxic adenoma progress slowly, but gradually increase in number and severity until a hormone balance is established, when there may be partial cessation of activity. Many symptoms remain unchanged in this quiescent period, such as rapid and irregular heart action on exertion, vasomotor disturbance, nervousness, irregular menstruation in females, gastric distress, tremor, etc., but with no loss of weight and no increased basal metabolism. The balance is held until such a time as pregnancy, lactation, focal or acute general infection stimulates the endocrine function, producing an increased activity of all symptoms until the individual becomes toxic.

The exophthalmic goiter may be primary or a selective type without any enlargement of the thyroid gland or it may develop in conjunction with a toxic adenoma. With a few exceptions the course is typical, the symptoms rapidly increase in severity until a crisis is reached, when they subside slightly. This period may last from eight to fourteen months, when another exacerbation occurs and another crisis.

Kendall, in 1914, identified thyroxin as the active principal of the thyroid gland.

Du Bois has standardized basal metabolism in the normal individual and Plummer has proved by extensive studies that thyroxin in excess raises the metabolic rate.

Hyperthyroidism designates over-activity and is characterized by definite

clinical findings of increased basal metabolism and symptoms of tachycardia, nervousness, tremor with trophic, myocardial and other degenerative changes in the toxic stage.

The relative stability of thyroxin is held in obedience by the normal physiological metabolism. But if the burden of excessive and prolonged secretion overcomes the normal physiological compensatory power there is a "whipping up" of all the endocrine units, first from hormone stimulation, then from the overwhelming amount of toxin secreted. Thus one link in the chain of internal secretions changes the normal function of all, illustrating what may happen when harmony is displaced by discord.

Diagnostic points in differentiating a toxic thyroid from a compensatory thyroid enlargement are:

Increased basal metabolism, tachycardia, pyrexia, tremor, gradual loss of weight, attacks of diarrhoea and glycosuria.

The thyroid gland is known to be the activator of metabolism, and, as the clinical test of basal metabolism has been proved, the indication for remedial relief presents itself whenever a sufficiently high basal metabolic rate is demonstrated. When medication and other measures fail, you must choose between surgery, x-ray or radium.

The physiological findings after radium treatment could be reported *en masse* by stating that there was a general return to the normal of all pathological manifestations. To clarify any illusions the different changes will be noted. The merits of radium treatment are strikingly shown in the number of our cases where the metabolic rate was taken before treatment and every three months thereafter. Some were normal in three months, others nine months after treatment. Those with a high systolic and a low diastolic blood pressure showed within a few weeks a more even balance of pulse pressure.

The improvement in blood pressure was noted three years before the installation of the metabolic apparatus.

Tachycardia, even in muscular exhaustion when there is dilatation and valvular incompetence, is soon controlled so that an apex beat of 160 will within a month record one of 100 or

120. Myocardial degeneration with fibrillation (unless there is a general arteriosclerosis) in the later stages will be relieved.

Tremor of the hands, fingers and lower limbs appears as one of the first symptoms and varies in different individuals. It is one of the first symptoms to subside after radium treatment.

Hyperidrosis is usually confined to the palms of the hands and soles of the feet, but in women at the climacteric it may involve the whole body surface. It usually subsides after a few months.

Trophic changes of the hair, nails, and cuticle show signs of improvement after the toxicity is controlled.

Within six weeks there is an increase in body weight, unless there is an extreme ptosis of the viscera.

In the adenomatous type there is a general decrease in the size of the enlargement which varies and appears to depend on the cystic condition present.

The specific physiological changes are many and are noted in the circulatory, digestive and nervous systems.

The blood coagulation time is lessened within a few weeks.

The leukocytosis found with a hyperactive thyroid is reduced to or below normal within a month.

The red blood corpuscles become richer in hemoglobin so that there is a distinctly higher color index.

The blood chemistry shows an increase of blood sugar in hyperthyroidism, which is brought under control through carbohydrate metabolism.

Digestive disturbances, such as hyperacidity and flatulence with periodic attacks of diarrhea are at first lessened in severity, and within a few months are completely controlled.

As a sequence of the digestive disturbance, with absorption of foreign proteins and the toxic condition present in very active hyperthyroidism, there will develop symptoms of headache, nausea and acetone odor of the breath. This condition of acidosis was found in three of our cases and was treated with glucose and alkalis for two days prior to the radium application and for several days afterward. There was a rapid response to medication and a gratifying result from the radiation. The balance of thyroid secretion, the main factor in the vicious circle, is restored.

*—Read at the Annual Meeting of the Radiological Society of North America, Detroit, Dec. 8, 1922.

Pulmonary Abscess Roentgenographically Considered*

WILLIAM H. STEWART, M. D.

New York City

PULMONARY abscess most commonly occurs after tonsillectomy and is due to the aspiration of an infected tonsillar plug. It shows itself, on an average, about ten days after operation and is characterized by severe stabbing pain in the chest, cough with foul expectoration, fever and malaise. A number of cases have been observed after other operative procedures, some of which are clearly the result of a septic infarct.

Pneumonia, either lobar or lobular, is second among the most common causes of pulmonary suppuration; it appears early, as frequently in insufflation pneumonias where there is a very rapid destruction of the lung tissue by gangrene with the formation of large cavities; or, as a late suppuration, the result of chronic pneumonia—the latter is very often observed complicating influenza-pneumonia. Such abscesses are usually multiple rather than single. There is also an insidious form occurring usually after exposure, in which the abscess is distinctly the primary lesion, the accompanying pneumonia secondary. Many cases of abscess of the lung have been reported following infection from the accidental intake of foul water into the lungs; these cases have been observed mostly during the summer months when the bathing season is at its height, especially in rivers or bays receiving town or city sewage. A number of cases of empyema, more often sacculated than general, break through the visceral pleura, and are responsible for pulmonary abscesses.

Lung abscesses may involve any portion of either lung. Following aspiration they usually appear in the upper lobes, while following infarcts or pneumonia they more often appear in the lower lobes.

While the clinical picture and physical examination are usually sufficient for diagnosis, the x-ray is especially valuable in locating the lesion and giving accurate information as to the extent of the process and the presence or absence of associated pathological conditions.

The early process, as seen roentgenographically, consists of a localized pneumonitis of varying degree. The character of the shadow is more often oval than circular in shape; within the center of this shadow of infiltration soon

appears a lighter area indicating cavity formation. The roentgenographic appearance depends upon the amount of secretion present; if the cavity be filled, one cannot distinguish between the infiltration and the fluid; and, if only partially filled, a fluid level can be seen with a clear area above. The infiltration varies greatly in character; usually the more acute the process, the more dense the shadow. Abscesses of old standing have well established pyogenic membranes and very little involvement of the lung surrounding the cavity. Before softening or gangrene occurs it is impossible to determine whether one is dealing with one or more abscesses.

If a single one is present, it is called a simple lung abscess and if multiple abscesses are in evidence, the case is diagnosed as bronchiectasis. Autopsies have shown that many cases exhibiting, roentgenographically, only one cavity, actually have one main abscess surrounded by numerous smaller cavities.

It has been clearly demonstrated that no case of lung abscess is completely cured nor out of danger of a "flare up", unless every roentgenographic sign of the lesion has disappeared, even though the patient be symptom free.

The most common lesion mistaken, roentgenographically, for lung abscess is a small sacculated empyema. To say whether the abscess is just beneath or just above the pleura is most difficult, as the process may be not only pleural but pulmonary as well; in this instance, the presence or absence of excessive foul smelling sputa determines whether or not the pulmonary structures are involved. A fistula between a sacculated empyema and a small branch bronchus accounts for the presence of the air bubble above the fluid level, but this opening between the lung and the pleural cavity may be so small or located so high in the empyemic cavity that only limited drainage will occur, thus confusing the diagnosis. In making the differentiation, one must be sure that the air bubble is not the result of needling; sacculated empyema (showing air in the upper portion of the cavity, which has been introduced through the aspirating needle) has more than once been mistaken for lung abscess.

The frequent occurrence of hemorrhage in the chronic form of lung suppurations, combined with cough and excessive sputa, may lead to a diagnosis of pulmonary tuberculosis. Cavities in the latter disease show little if any surrounding infiltration; position, labora-

tory findings and manifestations of the disease elsewhere in the lungs stamp it as tuberculous.

Certain cases of sarcoma of the lung simulate the multiple form of pulmonary abscess. The recognition of this type of malignancy is rather difficult and is usually discovered only on the autopsy table.

At the annual meeting of the American Roentgen Ray Society, held in Minneapolis in September, 1920, a joint paper was presented by Dr. Henry L. Lynah and myself, covering the treatment of pulmonary abscess by means of injecting bismuth-subcarbonate suspended in sterile sweet-oil, directly into the abscess cavity through a bronchoscope. The untimely death of Doctor Lynah has set back the work considerably, but the treatment is again being carried on by Dr. Richard Jordan and Dr. John D. Kernan, Jr., at the Lenox Hill Hospital, New York.

The author firmly believes that all cases of lung abscess, either simple or multiple, should submit to a thorough course of bronchoscopic treatment before resorting to surgery. While there is no question that a certain percentage of lung abscess cases will recover spontaneously, one should not wait for the possibility of such an event; bronchoscopic treatment should be commenced as early in the case as possible, manifestations of an acute infection should not be a contraindication.

As soon as the lesion is recognized, the establishment of free drainage by the bronchoscopic method is an immediate indication. In many cases the simple procedure of clearing out the bronchi by suction and opening up the swollen and edematous bronchus leading to the abscess will be sufficient. More difficult cases require injections of solution of silver salts, such as collene or silver nitrate. If the process be persistent, injections of the bismuth suspended in sterile sweet oil can be resorted to. I am confident that some cases show improvement when treated with the x-ray after injection of the bismuth, probably not only due to the effect of the primary rays, but also the secondary rays emitted from the bismuth.

Frequent roentgenographic examinations should be made while the patient is undergoing bronchoscopic treatment; by this means, as well as by clinical manifestations, the progress of the case can be determined. In demonstrating

*—Read at the Annual Meeting of the Radiological Society of North America, Detroit, Dec. 6, 1922.

this lesion roentgenographically, the chest should be examined in all positions, the prone lateral position, with the tube in front and the plate behind, has proved most satisfactory in the hands of the author; especially is it valuable when examining patients who are unable to maintain the erect posture. That cavities are more readily mapped out in this position is, no doubt, due to the fact that the abscess is more often oval than otherwise, with the long diameter extending from the root toward the periphery.

Cases of lung abscesses, in which there is a large amount of induration with a minimum amount of softening, and many of the multiple form, do not respond well to bronchoscopic treatment; in these surgery must be resorted to. The question of how long to wait before surgical procedure is a debatable

one; some cases received bronchoscopic treatment weekly for almost a year with a final recovery.

It is not within the scope of this paper to deal with the surgical requirements. It is necessary, however, for the roentgenologist to give the surgeon all the knowledge possible as to the exact location of the abscess or abscesses. Localization, by means of the x-ray, in positions other than the one in which the patient is to be placed on the operating table is not satisfactory. What information can be given by this method must be ascertained during a certain recorded phase of respiration, and one must be sure that the central ray is directly in line with the shadow of the abscess. In making the localization the relation between the abscess and bony landmarks must be described, rather than an attempt made to mark the patient's skin. Surgical flaps in thoracic

work are considerable and may disturb the surgeon when following the localization.

The ideal method of localizing a lung abscess is by fluoroscopy, using the adjustable head fluoroscope, after the patient has been prepared and placed in position on the operating table. The x-ray can be procured by means of a small transformer and tube immersed in oil, which can safely be used in the operating room.

Many cases of lung abscess have a localized area of pleuritic adhesions over the involved area of lung. Dr. Willy Meyer has suggested that a stereoscopic x-ray examination, after a pneumothorax, would map out this area and lead to more accurate localization of the abscess. Surgeons are reluctant to needle the lung in searching for a pulmonary suppuration.

Sarcoma of Back, with Report of Three Cases*

B. H. WAGNON, M. D.

Atlanta, Georgia

I AM bringing this subject to your attention for three reasons, namely:

(1) That these tumors occurred in the same position and from the same origin, namely, between the shoulders and from rhomboid fascia.

(2) That they were not malignant to start with, but had been removed for ordinary lipomas.

(3) That they occurred in persons of widely different ages and produced no metastasis although they recurred rapidly after each removal.

It is not surprising to find these tumors of spindle cell type; they are very common, of widespread occurrence, develop chiefly in subcutaneous or submucous tissues, fascia, muscles and peritoneum, etc., and according to Ewing they represent the purest form of fibroblastic neoplasm.

As a rule they are of low grade malignancy and I have no doubt that the first occurrence in these cases was simple lipoma.

These tumors usually occur singly, although there are numerous reported cases of multiple growths. Their form is rounded or lobulated and the edges are not sharply marked. In the fibrous small cell tumors they are very hard, but in the large cell growths, they are softer and more elastic.

Of the specific cause of sarcoma little is definitely known. These tumors demonstrate the great proliferative ca-

capacity of mesoblastic cells released from the restraints to growth. According to Ewing, "This capacity may reasonably be estimated as even greater than with most epithelial tissues. It is commonly assumed that normal adult cells are incapable of such great proliferation as occurs in sarcoma, and the further assumption is then necessitated that sarcomas as a rule grow from isolated, or superfluous, or embryonal cell groups. Increasing observations of early sarcomas of inflammatory origin favor the view that sarcomas often arise from previously normal adult cells."

To quote from Ewing again, "Many sarcomas show such marked histological resemblance to inflammatory processes that pathologists have long been inclined to accept in a certain sense the inflammatory or even the parasitic origin of certain sarcomas."

Syphilis and tuberculosis are the most prominent infections which lead to sarcoma.

Case No. 1: H.C.A., colored, male, age 29 years.

When 2 years of age, fell from bed, striking spool of thread, making bruised spot beneath shoulders that remained faintly visible throughout seven years, but gave his parents no concern. At age of 8 years, noticed small lump where this blue spot had been, about size of hen's egg; consulted family doctor, who advised operation, which was performed in ninth year; diagnosis of lipoma was made, with no pathological examination. The scar remained unchanged throughout ten years.

At the age of 19 years he noticed small nodule, appearing at lower end of scar, which grew rapidly and in one year reached the size of an orange. He consulted his family doctor again, who advised another operation, which was done. The wound was large and healed by granulations; growth was diagnosed lipoma. No pathological examination was made.

Three years later, at age of 22, there was a recurrence of growth, and at the end of a year, it was about the size of an orange. He consulted a local doctor, who diagnosed the growth lipoma, and who, with the aid of a second doctor, removed the growth, and after removal made a diagnosis of sarcoma, with no pathological examination.

Two years later he came to me with a recurrence. I made a diagnosis of sarcoma, removed the growth; pathological examination was sarcoma, large spindle cell variety. Owing to wide dissection that I made, healing was slow. I did the operation in June and it was March before healing was complete.

In July, 1921, growth had recurred, was of immense size, weighing thirty-eight ounces after removal. Pathological examination showed large spindle cell sarcoma. I did a wide dissection, sacrificing a great deal of tissue, and turned him over to Dr. John S. Derr for x-ray treatments. He gave him massive doses of x-ray, five treatments of ten minutes each with intervals of five minutes between, each exposure

*—Read at the 74th Annual Meeting of the Medical Association of Georgia, Savannah, May 4, 1923.

SARCOMA OF THE BACK—WAGNON

overlapping the other, covering the entire wound.

During first week of x-ray treatments he felt no effect, after which a violent itching and burning set up around the wound, which was treated with zinc oxide to allay the itching and burning. After six weeks, the burns were healed, he went back to Dr. Derr for further treatment and was given two treatments of ten minutes each, which left no sign of discomfort.

After one year and nine months the healed burnt surface remains the same. Healing at center of wound has been slow and is not yet entirely complete, although there is no apparent sign of recurrence.

The most striking characteristics of the growth from first to last are: absence of pain; rapidity of growth; absence of reasons for recurrence, as there were no bruises, licks or inflammations; negative to syphilis and to tuberculosis.

Case No. 2: E.K., colored, female, age 66 years, laundress.

Growth first appeared between the shoulders, about eight years ago, and was a small, soft, round nodule. I made diagnosis of lipoma and removed the growth, which was then about the size of a goose egg. Pathological examination showed sarcoma, small spindle cell variety.

The wound healed perfectly within a few days, but growth recurred again in one year, irregular in shape, multiple nodules, but forming one continuous mass. I did a second operation on January 26, 1921. Wound healed in a short time; pathological examination showed spindle cell sarcoma.

In a little over a year, it recurred and I removed it for the third time on April 4, 1923. Made wide dissection, removing the fascia, left the wound open to heal by granulations. The wound is now in process of healing.

There are no striking characteristics

in this case, but what is exhibited in practically all cases of small spindle cell sarcomas, namely, lack of metastasis; low grade malignancy; firmness of tumor; slowness of necrosis or ulceration; negative to syphilis and to tuberculosis.

Case No. 3: M.D., colored, female, age 40 years.

Growth first appeared two years ago. In April, 1922, I removed the growth from between the shoulders. It was about the size of an orange, oval, soft and non-vascular. The pathological examination was lipoma.

Patient returned in February, 1923, with a recurrence of the growth in same scar between the shoulders, the growth being about the size of a goose egg and nodular. I removed the growth for the second time, it was nonvascular, firm and appeared to be muscle tissue. Pathological examination showed it to be small spindle cell sarcoma; negative to syphilis and to tuberculosis.



EDITORIAL

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ANNUAL MEETING

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Roentgen and Medicine

THE MEASURE of success in life as held up by the great Alexandre Dumas when he asked, "Will anything I have written live after me?" can be answered in the affirmative so far as the late Conrad Roentgen is concerned. Although he was about fifty years of age when he discovered the x-rays, he lived to see his discovery reach an importance in the scientific and commercial world equal to the discovery of the microscope. Both of these additions to science mark an epoch in the advance of medicine.

Although Roentgen himself was not a physician, the x-rays were quickly applied to medicine. Within one week after the announcement of the discovery of the x-rays, Cox of Magill University, Montreal, successfully located a bullet which had been lodged in the leg of a patient for seven weeks. The following day the bullet was successfully extracted.

In England the first "x-ray photograph" was made January 16, 1896, by Campbell Swinton, using his own hand as a subject. The miniature apparatus used by him required twenty minutes exposure to produce this historic negative, which is still preserved in the museum of the Royal Photographic Society. In February, 1896, Porter, of University College, London, reduced the exposure time to four minutes by using a coil with a spark gap of three inches. The same month Swinton, using a ten inch coil at half capacity, made a successful radiogram of the human foot with an exposure of only fifty-five seconds.

The first radiogram made in England of a gunshot wound was made by Oliver Lodge, at Liverpool, and was recorded in the British Medical Journal February 22, 1896. In the same issue also appeared the first demonstration of a fracture of one of the finger bones done at St. Thomas' Hospital.

On January 27, 1896, at a meeting of the Paris Academie des Sciences MM. Lannelongue, Barthelemy and Oudin read a communication upon the utility of the x-rays in human pathology. They called attention to the fact that the x-rays could be used to reveal either an atrophy of bone or an overproduction of bone.

American physicians were quick to realize the value of x-rays in medicine, so that almost immediately after the public announcement of their discovery American electrical

engineers had apparatus ready for the physicians' use. Even in Omaha there were two x-ray equipments as early as 1898, the one in the office of the late Dr. Robert Jansen, and the other in the office of Dr. John P. Lord.

In 1898, while still a student at Harvard Medical School, W. B. Cannon employed powdered heavy metals to study the alimentary tract of laboratory animals, his observations being published in the American Journal of Physiology 6:251, 1901-02. In 1899, Dr. Francis H. Williams of Boston began the examination of the alimentary tract in human beings by means of the metallic opaque meal.

In 1905 Mr. Clyde Snook, an American electrical engineer, succeeded in producing a mechanical rectifying switch which made it possible to employ alternating current transformers in producing x-rays. Up to this time only direct current could be used, the capacity of the coil being limited by the inherent mechanical defects of the interrupters used in conjunction with them.

Following the invention of Mr. Snook, the tubes were the weakest link in the chain of advancement. But in 1913 this weakness was overcome by Prof. W. D. Coolidge, who then perfected the hot cathode type of x-ray tube which bears his name. These two fundamental improvements in apparatus made possible rapid advancement in the medical uses of the x-rays, both diagnostically and therapeutically.

But even before these improvements in apparatus much advance had been made. Mention need be made only of pyelography devised in 1906 by Voelcker and Lichtenberg and brought into common use by Braesch, 1910, of practical demonstration of gall stones by L. G. Cole, 1914, pneumoperitoneum by Jacobaeus, and of ventriculography by W. E. Dandy, 1918, to show the rapid advance in refined diagnosis by means of the x-ray.

Contrast the difference in the radiogram of the hand made by Swinton in 1896, requiring twenty minutes exposure and showing little or no detail, with the instantaneous radiograms made today of any part of the body, showing almost microscopic detail, and a faint idea of Roentgens' contribution to medicine will be had. In therapy, the contrast between the ten inch coil and the twenty inch modern transformer is equally great. To get a still stronger impression of the value of x-rays to medicine one need only ask the surgeon how he would like to practice surgery without the x-rays.

The present status of radiology, then, is due to the combined and cumulative effort of all the men mentioned as well as many others. This brings forcibly to mind the great debt medicine owes to the late Roentgen. Countless generations will revere his name as the great contributor to the betterment of suffering humanity. The constructive thought of the individual, coupled with co-operation of allied lines of endeavor, brings research to successful fruition.

Technicians

IT IS GENERALLY conceded by every radiologist that the technician is a necessary part of his personnel. In fact, the technician has become just as necessary to the radiologist as the nurse to the physician. Experience has proved that the trained nurse usually makes the best type of technician. In this particular role she plays a double part.

There has been considerable interest shown by various organizations during the past few years relative to giving the

technicians in radiology greater recognition, incidentally being thus able to raise the general standard of training for technicians. In this connection it would appear that each radiologist should become a teacher, teaching his own technician. A few suggestions may not be out of place relative to the information which should be imparted to every radiological technician.

It will be necessary, of course, for the technician to have training in the ethics of his or her profession. Where a graduate nurse is being employed she has already been given this instruction during her training at the hospital. Where a lay technician is used this subject will need to be given considerable stress so that the technician will grasp the fitness of things and recognize his relationship to the physician by whom he is employed, as well as to the patients with whom he comes in contact.

Technicians' training should cover several phases. The first phase would be instruction in the elementary principles of physics underlying the use of the instruments with which they must work each day. Instruction should be given in the electrical dangers connected with the instruments, dangers to the patient from high voltage shocks during the work; dangers to the workers with the instruments from high voltage shocks; a working knowledge of the particular machine which the technician is using should be given, as well as instruction in the fundamental principles underlying all x-ray power plants.

The second subject should be that of instruction in exposure technique, the various factors being shown and their influence upon good photographic results demonstrated. Special stress should be given to the subject of voltage, milli-ampere, distance and time. The influence which each of these factors has upon photographic results should be explained, also special emphasis should be laid upon the inverse square law in relationship to distance.

Third, there should be instruction in dark room technique. Since ninety per cent of all trouble with x-ray photographic results is traceable to the dark room, it does not seem that this part of the training of the technician can be overemphasized. Specific stress should be put upon the matter of cleanliness in the dark room, together with the value of being over particular about the chemical processes employed. The influence of temperature on the developer should be stressed and the matter of time should be impressed upon the worker.

Fourth, should be the subject of positions, the technician being instructed carefully in the exact positions necessary to bring out the various anatomical features used in examination.

Fifth, the technician, of course, should be instructed in the formulas used for various types of opaque meals, opaque enemas, together with preparation of opaque solutions for demonstrating fistulous tracts.

Sixth, the technician should be well trained in the

dangers incident to exposure of the body to x-ray so that she may know how to avoid x-ray burns on the patient and take proper care of herself. It has been the experience of most radiologists that graduate nurses who have some inclination toward mechanical things make better technicians. This type of technician is always anxious to do better work and is willing to co-operate with the radiologist in every possible manner.

It is imperative, then, that the radiologist should encourage the cooperative spirit amongst the technicians and that he should lay particular stress upon the desire of the technician herself to make higher standards. There have been numerous expressions from the technicians of a desire to bring this about and there is great opportunity for the radiologists of North America to cooperate with them in this regard.

It is a well known fact that physicians become better men by associating with each other in scientific societies and socially, and the same rule holds good with technicians, consequently, the radiologists of North America should encourage technicians in the holding of meetings where they may discuss problems which are of particular interest to them.

The Radiological Society has been active in the promotion of this spirit for several years and under the auspices of this society, the registration of technicians was instituted. This work is progressing nicely and is attracting considerable attention throughout the United States. It seems to the writer that the technicians would receive great benefit from a meeting held at the same time and place as the annual meeting of the Radiological Society.

Utah Society of Radiology and Physiotherapy

The following officers were elected at a recent meeting:
President Mark Brown, M. D., Ogden
V.-Pres. Frederick Leaver Stauffer, M. D., Salt Lake City
Sec'y-Treas. . . James Philip Kerby, M. D., Salt Lake City

The New England Roentgen Ray Society

At its last meeting this society elected the following officers:
President P. F. Butler, M. D., Boston
Vice-Pres. W. A. LaField, M. D., Bridgeport, Conn.
Secretary-Treasurer . . . A. S. MacMillan, M. D., Boston
Member Executive Comm. . . G. W. Holes, M. D., Boston

Dr. Clay E. Giffen

Telegraphic announcement of the untimely death by drowning of Dr. Clay E. Giffen, of Boulder, Colorado, comes as a distinct shock. Details are not available now, but autobiographical sketch will be printed in the September issue.

Dr. Giffen was a stalwart member of the Radiological Society and a painstaking radiologist. His sudden demise is a distinct loss, both to the Society and the profession.



DEPARTMENT of TECHNIQUE

Hot Weather Fixation for Warm Weather Washing

E. G. C. WILLIAMS, M. D.
Danville, Illinois

HOT WEATHER brings dark room difficulties to the radiologists in towns drawing water supply from rivers or shallow lakes. If unlimited ice is available, the difficulty is easily surmounted, but if ice is scarce or hard to obtain in office buildings, a system of fixation that will give good hard films with a minimum of ice is desirable. Several years of experimenting with various types of tanks and ice supplies have resulted in our using a simple system that requires less than fifty pounds of ice per day. This has been accomplished by separating our wash tank from the developing and fixing tank and in using a hardening fixation that prepares the emulsion for washing in water that often reaches 84 degrees. The two tanks as illustrated in the figure are best placed beside each other about eight inches from the wall to allow space for a safe light behind the first tank and a view box behind the second. Number 1 holds a 3-inch

porcelain lined insert tank for developing and a 4 $\frac{3}{4}$ -inch tank for fixing with a space for icing the water between the two. The hardening bath used has been selected from the many that have been tried because of its hot weather virtues. A stock solution of acid hardener is made in a five-gallon bottle or stone jar and one-half gallon is used each time the tank is filled. One filling is sufficient for at least 500 films. Materials for five gallons of hardener are:
Water.....10 Qts.
Sodium Sulphite.....5 Lbs.
28% Acetic Acid.....6 Qts.
Powdered Potassium Alum...5 Lbs.

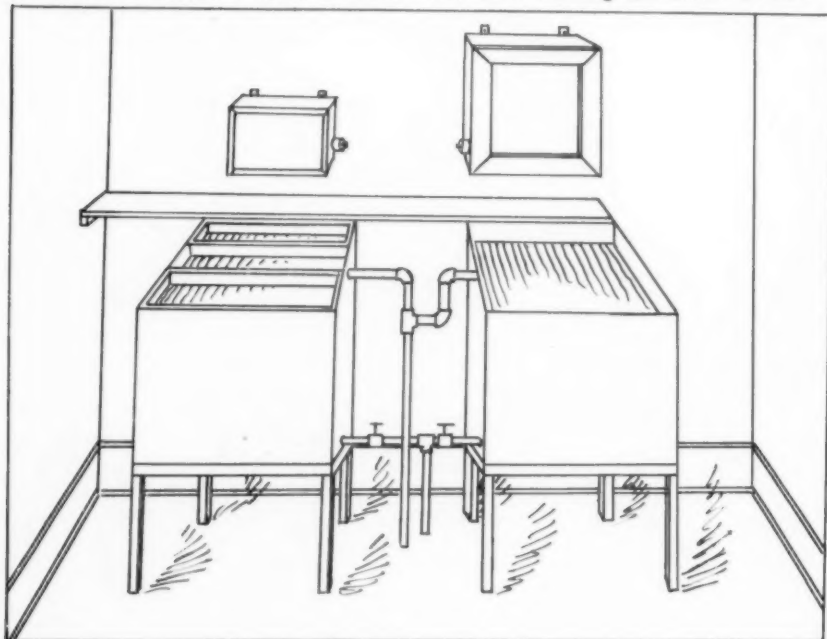
Heat the sodium sulphite in six quarts of water. It will not dissolve but will form a milky suspension which settles rapidly unless stirred. Pour the suspension into the five-gallon bottle which contains two quarts of warm water to prevent breaking. Add the acetic acid by siphon through a rubber tube rotating the bottle to insure

solution of the sulphite. When the acetic acid is all in, the sulphite will be in solution. Dissolve the alum in the remaining two quarts of water and add to the bottle while stirring constantly. Fill the bottle with water to the five-gallon mark. The result is a clear solution that will keep indefinitely.

To make five gallons of fixing bath, dissolve twelve pounds of Hypo in two gallons of water by heating or by standing 24 hours in four gallons of water. Pour the Hypo solution into the tank, add one-half gallon of the stock hardening solution and fill the tank to within one inch of the top. Stir thoroughly before using. As the level of the bath in the tank is lowered by use, add water or ice until the fixing time is definitely increased then make new bath. The solution as made is so concentrated that it will stand considerable diluting.

Cool the tank with broken ice to below 70 degrees. Leave films in the fixing bath for at least fifteen minutes, then they may be washed at a temperature of 83 degrees or more for fifteen minutes without injuring the emulsion, giving films that are clear and free from bloom. Washing should be accomplished as rapidly as possible without jets of water actually striking the films. Supply and over-flow pipes should be on the same side of the tank to insure complete circulation and rapid change of water. The water should run through the tank at a rate that would completely fill the tank in five minutes.

An insulation covering of asbestos or fiber board on the first tank will further help to maintain a low temperature and save ice. An insulated tank cooled in the morning will remain cool all day. The ice water compartment is washed out each morning before icing as the films are dipped into the ice water between developer and fixing bath.



NEW EQUIPMENT

Engeln X-Ray Fracture Unit

THE NEW Engeln X-Ray Fracture Unit, having a 30 ma. radiator tube, oil-immersed, is absolutely shock-proof from any high tension or live wires. The busy surgeon, reducing fractures or operating with the fluoroscope, can positively ignore any subconscious feeling that he must be careful of high tension wires. Any part of the apparatus can be touched, bumped or leaned against with complete safety. The surgeon and any of his assistants can work in closer co-operation than ever before possible when reducing fractures.

Although this new unit is spoken of as an x-ray fracture unit, it is especially adapted for locating foreign bodies, operating under the fluoroscope or for horizontal fluoroscopy. In addition, the 30 milliamper capacity of the apparatus with a full five inch back-up, permits its use for radiographic work.

The 30 ma. Coolidge radiator tube is entirely immersed in oil in the transformer box. This construction has been in use for several years at the Mayo Clinic, Harper Hospital and a number of other hospitals and clinics.

The aluminum table top has many distinctive advantages over any other kind. It can be easily cleaned and will not stain after reducing fractures or operating under the fluoroscope. The aluminum top can also be removed for thorough sterilization and polishing if necessary.

The table is 6 ft. 6 in. long, 30½ in. wide and 30¾ in. high, giving the surgeon ample and correct facilities for his work.

The transformer box with the 30 ma. radiator tube immersed in oil hangs under the table on a special double suspension roller-bearing carriage. Three point suspension is used to assure continual contact of all roller bearings and an easy sure movement of the transformer box. The transformer box with the tube inside can be moved over the entire length of the table and also across the table because of the double suspension. This is clearly shown in the illustration.

The motion of the transformer box with the oil-immersed radiator tube is controlled by the diaphragm shutter handle.

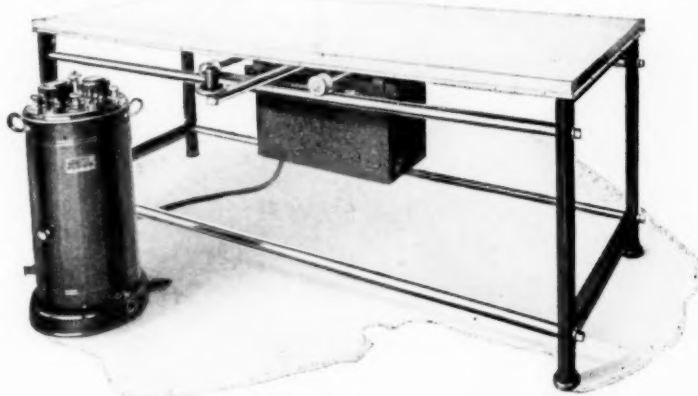
The Engeln shock-proof fracture unit control may be placed in any desired position. Your fluoroscopy can be controlled with the hand switch or the convenient foot switch. The control is equipped with a milliammeter; voltmeter, auto-transformer, adjustable for any spark gap up to 5 inches; magnetic filament control; main switch; and both hand x-ray switch and foot switch.

The convenient and practical arrangement of the meters and switches is clearly shown in the illustration.

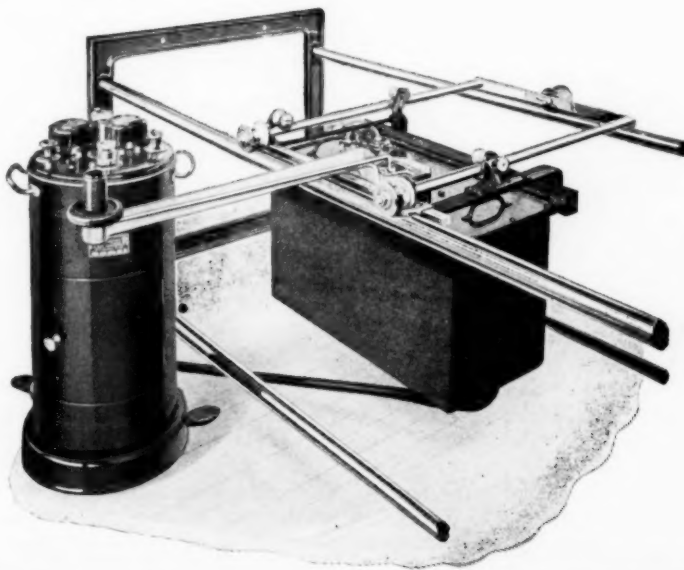
The auto-transformer is controlled by the voltage selector for obtaining

your spark gap. This switch is directly connected to an auxiliary switch which gives a working range of 90 volts in 48 steps on the voltmeter. In other words, a spark gap varying from 2½ in. to 6 in. can be obtained automatically by adjusting the voltage selector.

The entire apparatus is built of metal with a black satin finish and nickel trimmings. The apparatus is shock-proof—no live wires. Every surgeon in the country needs this apparatus, which fully protects him in reducing fractures or operating with the fluoroscope.



Illustrating the Engeln X-Ray Fracture Unit, separate control; transformer, x-ray tube and all high tension connections, immersed in oil in transformer box.



The aluminum table top can be easily removed. The surgeon can lean against or touch this apparatus with assured safety during its operation—it is shock-proof.

CASE REPORTS

Nevus Vasculosus (Strawberry Mark)

Report of a Case Cured by Radium Therapy

HAROLD SWANBERG, B. Sc., M. D.

Quincy, Illinois

OF the clinical types of angioma, the nevus vasculosus and angioma cavernosum respond most perfectly to radiation therapy. While either x-ray or radium can be used, the author's experience has been limited to the use of radium. Radium therapy is the method of choice of most dermatologists, the effect of the beta rays of radium being much superior to that of x-rays or gamma rays in nevus vasculosus. The following case of nevus vasculosus is reported and the photographs made before and after the radium treatment was completed, show the end-results

that can be expected in the average case.

Baby M. C., two months old, was referred to me by Dr. C. A. Wells of Quincy. He was apparently a normal baby in every way, with a history of normal delivery. At birth a very small reddish area was present on the forehead on the right side just above the brow. This grew rapidly and when I first saw him was nearly oval in shape, 11 mm. in its greatest diameter, intense bright red in color, sharply circumscribed and raised about 1 mm. above the level of the surrounding skin. Radium therapy was immediately begun.

The lesion was closely surrounded by a lead shield and a full strength radium plaque covered by 0.5 mm. of rubber was placed over the nevus. A six minute exposure was given every three weeks at first. The time factor was gradually increased to twenty-one minutes and the intervals to one month. It was found that a twenty-one minute exposure produced a mild erythema, and the dosage was cut to seventeen minutes. Sixteen treatments were given in all, within one year's time.

The photograph (Fig. 22) made four months after the last treatment shows the end result. The nevus has entirely disappeared and is replaced by fibrous tissue, being level with the surrounding skin.

MacKee in his recent work on, *X-Rays and Radium in the Treatment of Diseases of the Skin*, says: "The results of beta ray therapy in nevus vasculosus are so striking, so perfect, that they can be placed among the most notable achievements of radium therapy in the treatment of cutaneous affections." The author of this paper believes that physicians in general are not acquainted with the wonderful results of radium in these cases, hence this brief report. Such cases should be referred early for radium treatment (adult lesions are more recalcitrant than those in children) and thus save the parents months or years of unnecessary worry and anxiety.



Fig. 1—Age two months. Nevus vasculosus on forehead.



Fig. 2—Age 18 months, same case as Figure 1. Photograph taken four months after completion of radium treatment.

ABSTRACTS and REVIEWS

The Cancer Control Problem. Edward H. Risley, M. D., J. Maine M. A. 13:218-229, April 1923.

CANCER control is possible, the author believes, and it can be attained in much less time than was taken to control pulmonary tuberculosis. The results attained by Dr. Bloodgood in Maryland prove that cancer can be controlled to a very great extent. The fact that the public has been put in a receptive frame of mind through the

benefit derived from nation wide propaganda such as that against tuberculosis will make a similar campaign against cancer more easily achieved. There is no doubt that the intelligent public is steadily and increasingly demanding more of the medical profession in the way of enlightenment and aid to well-being.

Dr. Bloodgood has stated it as his opinion that education of the physician, dentist and layman will do more to

control cancer than will any improvement in surgical or radiological technique. Since his personal efforts toward this sort of education in Maryland he has found "that the number of inoperable or hopeless cases coming to him for advice has been reduced from 48 per cent to 19 per cent; the number of operable and probably curable cases has increased from 3 per cent to 23 per cent and that the number of benign lesions seen has increased

from 3 per cent to 48 per cent or thereabout."

The educational campaign carried on in Maine for the past year has begun to show results in the number of early cases reporting for examination.

In Maine the work is directed by a committee of three, appointed by the State Medical Association, and another committee of nine, of whom three of the members are the three just mentioned. The others are the following individuals, a member of the State Board of Health, one from the Public Health Association, the head of the Maine Federation of Women's Clubs, the head of the Maine Nurses' Association, the head of the Maine Federation of Grangers, and the head of the Maine Federation of Labor.

The hopeful facts about cancer have been presented to a large number of lay audiences. A standard lecture was prepared and sent to every physician throughout the state. This lecture set forth the accepted and proven facts about malignant disease and was representative of the consensus of opinion of a large group of physicians of note rather than the opinion of any one man; this feature alone added greatly to the effectiveness of the campaign.

In addition to the general campaign special activities were carried on throughout cancer week. Lectures were given in theatres, churches and schools, before small groups of women everywhere in the state and in Portland before the employees of nearly all the large department stores. In one county the doctors coached their wives who then lent their aid in reading the lecture to groups and small audiences. Besides these lectures the newspapers published the standard lecture, and copies of the lecture and other literature were sent by R. F. D. to localities which could not be reached in any other way. In two years more Maine expects to have carried this educational effort to the point where no adult in the state is any longer ignorant of the most important facts which he should know about cancer.

There is also the phase of the problem as it applies to the physician. The importance of early diagnosis, of a complete physical examination, visual and digital, and the fatal results of procrastination must all be presented to physicians along with the facts pertinent to his understanding of cancer etiology, pathology and therapy.

The author feels very strongly that palliative treatment should be frankly stated to be such. If this is not done the inevitable fatal termination of the case will lead to erroneous opinions and conclusions on the part of the community and will react unfavorably upon cancer control.

In the discussion which followed this paper the main subject was the need of unprejudiced judgment and use of all available means of therapy. Surgery, x-ray, radium, and electrocoagulation as well, has each a proper place in cancer therapy and the wise specialist will not exclude any adjunct whose worth is as well attested as that of each one of these agents.

Diagnosis of Pyorrhea. Charles K. Field, D. D. S., Dental Facts, 2: 72, May 1923.

THE x-ray indication for pyorrhea may vary from a slight breaking down of the margin of the alveolar bone in the interproximal spaces to wholesale destruction of the cancellous bone surrounding the infected tooth.

Abscesses may be self-limited or diffuse and the latter are not so easily interpreted on the plate. With practice, however, a diffuse abscess can be recognized by a slight thinning of the alveolar process extending over a considerable area.

Rudyard Kipling on Research. The Lancet, 204:402-403, Feb. 24, 1923.

THE following excerpts are taken from an after-dinner speech made by Rudyard Kipling upon the occasion, last winter, of the celebration of John Hunter's birth. It is a beautifully worded tribute to medical research.

"There is a legend which has been transmitted to us from the remotest ages. It has entered into many brains and colored not a few creeds. It is this: Once upon a time, or rather at the very birth of time, when the Gods were so new that they had no names and Man was still damp from the clay of the pit whence he had been digged, Man claimed that he, too, was in some sort a deity. The Gods were as just in those days as they are now. They weighed his evidence and decided that Man's claim was good—that he was, in effect a divinity, and, as such, entitled to be freed from the trammels of mere brute instinct, to enjoy the consequence of his own acts. But the Gods sell everything at a price. Having conceded Man's claim, the legend goes that they came by stealth and stole away this godhead, with intent to hide it where Man should never find it again. But this was none so easy. If they hid it anywhere on Earth, the Gods foresaw that Man, the inveterate hunter—the father, you might say, of all hunters—would leave no stone upturned or wave unplumbed till he had recovered it. If they concealed it among themselves they feared that Man might in the end batter his way up even to the skies. And while they were all thus at a stand, the wisest of the Gods, who afterwards be-

came the God, Brahm, said: 'I know. Give it to me!' and he closed his hand upon the tiny unstable light of Man's stolen godhood, and when that great hand opened again the light was gone. 'All is well,' said Brahm, 'I have hidden it where Man will never dream of looking for it. I have hidden it inside Man himself.' 'Yes, but whereabouts inside Man have you hidden it?' all the other Gods asked. 'Ah', said Brahm, 'that is my secret, and always will be unless and until Man discovers it for himself.'

"Thus, then, gentleman, does the case stand with Man up to the present * * * he might be defined as 'An imperfectly denatured animal intermittently subject to the unpredictable reactions of an unlocated spiritual area.'

"And it is just this search for this unlocated spiritual area, whether it be a growth or a survival, which has pre-occupied Man from that day to this. The priest and the lawgiver have probed and fished for it all through the ages; but, more than any other, through all the ages, the leech, the medicine-man, the healer, has been hottest on its track. He has searched wherever he dared, openly or furtively, in safety or at the risk of his life. In the early days the astrologer-physician, as he called himself, dreamed that the secret of Man's eternal unrest was laid up in the sun, moon and stars; and consequently, since all created things were one in essence, that an universal medicament for Man's eternal woes would be discovered upon Earth. So he searched the earth and the heavens for those twin secrets, and sacrificed himself in the search as a matter of course. Later when the embargoes on the healing art were lifted * * * the nature of his dreams were changed for a while. He had found more wonders beneath his knife than earth or the planets had heretofore shown him. And that was barely ten generations ago. Once again *

* he * * * renewed his search and once again sacrificed himself in the search as his passion drove him. There is no anesthesia so complete as Man's absorption in his own job.

"Man, the imperfectly denatured animal, who cannot trust the evidence of his own senses in the simplest matter of fact; whose evidence on the simplest matter is colored by his own iniquities; Man, always the hunter, went up against the darkness that cloaked him and every act of his being, to find out what order of created being he might be. He called it scientific research. It was the old quest under a new name. But, this time, the seekers who headed it, unlike the priest and the lawyer, admitted that they knew very little. Experience had taught them to be humble.

For that reason their knowledge was increased."

The editor of the *Lancet*, in his comment, says: "No sweeter or truer words could have been used to describe the leaders of scientific research. To probe, to question and to doubt have comprised their duty; but discharge of that duty, when faithful, has compelled them to be humble in the presence of the vast revelations which have followed."

The X-Ray in the Diagnosis of Pulmonary Tuberculosis. A Comparison of X-Ray and Physical Signs in 1000 Cases. Harry Lee Barnes, M. D., Am. Rev. Tuberculosis, 7: 202-206, May, 1923.

MORE than one thousand consecutive cases believed or suspected to have pulmonary tuberculosis were studied at the State Sanatorium at Wallum Lake, Rhode Island, and the following observations were made: "With rare exceptions, a negative x-ray in a positive sputum case means poor technique or inaccurate interpretation of the plates. Where suspicious physical signs are found at an apex and the x-ray is negative, it is best to restudy the plate, and when the x-ray shows densities in areas previously found free from physical signs it is wise to re-examine the lungs."

The author's summary reads as follows: "(1) Of 592 positive sputum cases only 5 were read as negative to the x-ray and rereading of the films showed that 4 of the 5 had slight changes at the apex. (2) Of 592 positive sputum cases, x-ray evidence of involvement of the second apex, unrevealed by physical examination, was shown in 6 per cent. (3) Of 592 positive sputum patients, in 380, or 64 per cent, the x-ray evidence of disease was more extensive than the physical signs; in 36 or 6 per cent, the physical signs were more extensive; and in 176 or 30 per cent the amount of lung involvement was about the same as indicated by the two methods. (4) Of 310 apices of negative sputum patients, in which dullness or moist rales had not been found, 40 per cent showed abnormal x-ray densities. (5) Of 728 apices of negative sputum patients, showing dullness or moist rales, 36 per cent were negative to the x-ray. (6) In negative sputum patients both dullness and rales were found in 40 per cent of the apices showing specks, 39 per cent of apices showing streaks and 30 per cent of apices showing haziness."

Prognosis in Tuberculosis of the Lungs from Examination by the X-Rays. A. Howard Pirie, M. D., Am. J. Roentgenol. 10:366-368, May, 1923.

THE author states that favorable prognosis is based upon absence of abundant mottling; presence of calcification in roots of lungs, and better still, in parenchyma of lungs; also in no diminution in the size of the heart.

Unfavorable prognosis is based upon abundant fluffy mottling; no calcification anywhere; diminution in size of heart. This diminution is out of proportion to that of other muscles.

Ten case reports are presented.

X-Ray Study of Tuberculous Lungs. Thompson Frazer, M. D., and John D. MacRae, M. D., New York M. J. & M. Rec. 117:34, Jan. 3, 1923.

IN considering the use of the x-rays in the diagnosis of chest infections, questions frequently asked are: (1) What is the value of x-rays in the diagnosis of tuberculosis? (2) Is it necessary that they be employed? (3) If not, why the necessary expense? (4) Do the x-rays supply any information not obtainable by other means? (5) Are the findings in accord with the physical examination? (6) If not, to which should the greater importance be attached? (7) Will the x-rays supersede other methods?

Rather definite answers can be given to these questions: (1) The x-ray is a procedure of inestimable value in tuberculosis. (2) In many cases, perhaps most cases, the other older methods will establish the diagnosis. (3) By the x-ray, one obtains a more complete clinical picture which fully justifies the extra expense. (4) Radiographs frequently disclose conditions not discoverable by other means. (5) The findings of physical examination and those shown by x-ray are frequently not in accord; usually the x-ray shows more pathology than would have been expected from the physical examination. (6) The information from radiographs should simply supplement the physical examination. (7) The x-rays will not, therefore, supplant the older methods. The roentgenologist should go as far as he can in describing his findings; he should make as much of a diagnosis and as much of a prognosis as he can, entirely from the x-ray findings. He should then consult with the clinician, and in conference make such changes in the final conclusions as may be indicated by the joint findings.

—W. WARNER WATKINS, M. D.

The Value of the Roentgenogram in the Diagnosis and Prognosis of Pulmonary Tuberculosis. Geo. G. Ornstein, M. D., New York M. J. & M. Rec. 117:19, Jan 3, 1923.

THE technique must be correct if correct interpretation is to be made. There must be a clear appreciation of the normal appearance of the lung shadows. Cole's pioneer work, dating back to 1908 still stands unquestioned. From a roentgen standpoint, tuberculosis of the lungs may be classified according to whether it involves the hilus, the bronchial trunks or the parenchyma, or any combination of these.

In hilus tuberculosis, there is something besides the normal picture, the hilus shadows extend out more or less in a diffuse manner, with a few calcified or fibrous tubercles. Other conditions may cause very similar shadows in this region.

In peribronchial tuberculosis there is a thickening of the bronchial trunk with tubercles to be seen here and there along its course; in places these may extend out into the parenchyma. This type is confined chiefly to the upper half of the lung.

If the parenchymatous type is present, there is little difficulty in seeing it; it is invariably confined to the upper half of the lung. When tubercles can be demonstrated in the parenchyma and are confined to the upper regions, tuberculosis may be confidently diagnosed. (Note: "Tubercle" is used here in the sense of Cole's description, as meaning a sufficient amount of tuberculous deposit to be seen grossly on the autopsy table).

The extent of the lesion may be best classified in the manner of Brown, Heise and Sampson: (1) Incipient or minimal—A total area of involvement not greater than to the upper level of the second chondro-sternal articulation on one side, or an intense pleuritic shadow. (2) Moderately advanced—Parenchymal involvement to the upper level of the fourth chondro-sternal joint of one side; or rarefaction cavities limited to one interspace; or scattered mottling greater than minimal but not greater than one entire lung; or the minimal area on both sides. (3) Far advanced—Greater areas than (2).

The pathological conditions from which tuberculosis need to be differentiated on the roentgenogram are pneumoconiosis, syphilis, pulmonary abscess and various tumors of the lung.

The shadows in pneumoconiosis are more uniform in density, have sharper margins, are larger in size and are more evenly distributed, extending out from the roots almost equally from both sides. The two conditions often exist together.

In syphilis of the lung, the lesions may be gummatous or interstitial; they attack the base of the lung usually. Gummata have a definite shape and

ABSTRACTS AND REVIEWS

are invested with a dense capsule; the interstitial type is an intense fibrotic infiltration into the base, or an infiltration of all bronchial trunks throughout the lung.

Pulmonary abscesses and tumors can be differentiated from tuberculosis by the exercise of reasonable care and judgment in interpretation of shadows.

The determination of clinical activity is based on the character of the shadow cast by the tubercle as indicating whether it is firmly walled off, or whether the shadow indicates new formation.

Next in importance to the ability to determine clinical activity of the lesion is the importance of the roentgenogram in determining the prognosis.

—W. WARNER WATKINS, M. D.

Pneumoconiosis: Reports of Cases. Alfred L. Gray, M. D. and J. Lloyd Tabb, M. D., *Virginia M. Monthly*, 49:647, Feb., 1923.

THE work of Jarvis, Pancoast and others has shown that the appearances on the roentgen plate are the result of reaction of the tissues to the presence of the foreign irritating material, rather than to actual accumulations of the dust material, except in the case of opaque materials; these may show as small, dense white spots distributed more or less generally throughout the lung.

The distinguishing characteristics whereby one may in most cases diagnose pneumoconiosis are: (1) The more general distribution of the lesions throughout the lung. (2) Their similarity to each other in shape, density and general appearance. (3) Their existence in greater numbers in the lower portions of the lungs, especially the right. (4) The absence of clinical history indicating infection. (5) The absence from the sputa of characteristic bacteria. (6) The rapid disappearance of many of the roentgenographic appearances when the individual is for a short period removed from exposure to dust inhalations.

—W. WARNER WATKINS, M. D.

Osteochondritis Dissecans. Albert H. Freiberg, M. D., *J. Bone and Joint Surg.* 5:3, Jan., 1923.

OUR knowledge of this condition is due to the surgeon, Franz Koenig, who described the condition accurately in 1888, as follows:

"Those loose bodies which are formed in a joint, for the most part gravely diseased, stand in diametric contrast to such whose genesis is to be ascribed to an entirely circumscribed disease of the joint ends, which has been described as *osteochondritis dissecans*.

"Without any injury, there separate from the joint ends, fragments of varying size, in consequence of a process as yet unexplained; their bony surface becomes covered with a dense connective tissue containing cartilage cells, here and there. In the same manner the defect in the bone becomes smoothed over. In some cases a smaller body composed entirely of bone and smooth with the appearance of necrotic bone, lay under a larger piece perhaps two centimeters in diameter. These pieces often fitted almost exactly in the corresponding bone defect, seeming at times somewhat too large because the pits in the bone had become filled in. Aside from this, together with a fluid effusion and a slight villous hypertrophy, these joints looked perfectly sound and they remained to after the removal of the loose bodies."

The author reports four cases of the disease in the knee and one in an elbow. In all the x-ray findings were characteristic, in the knee the internal condyle of the femur showing a niche in the bone and loose body, the elbow showing a similar niche in the bone and loose body from the humerus. Traumatism is not regarded as a prime factor, the process seeming almost inevitably to be due to an infarction similar to that seen in other organs with terminal arteries. A concomitance of several elements seems necessary for this condition, namely, terminal arteries at this point; a long tubercle of the tibial spine; repeated small trauma in the position of flexion and outward rotation of the tibia on the femur.

Arthrotomy with removal of all the loose bodies is the only treatment.

—W. WARNER WATKINS, M. D.

Crush Fractures of the Spine. James O. Wallace, M. D., *J. Bone and Joint Surgery*, 5:28, Jan., 1923.

THIS is a study of 82 cases of fracture of the spine, a great majority of which had been unrecognized and untreated. In 67 of the cases there was a history of forcible flexion of the spine, from three types of injury: (1) Heavy object falling from above alighting on the patient, usually when the spine was slightly flexed; (2) Patient falling from a height striking on the head and shoulders; (3) Patient being caught between two objects causing slow forcible flexion of the spine. In the first group there were 45 cases, second group 17 cases and third group 5 cases.

In the 47 undiagnosed cases, the shortest elapsed time was 25 days and the longest 1045 days. In 23 cases there were other fractures outside of the spine. Fracture of the transverse process was the most common injury;

fracture of the spinous process occurred in only three cases and of the articular processes in one case.

With regard to pain, there are records in only 60 cases. Of these 30 had back pain and referred pain; 20 had back pain alone; four had referred pain only and six had no pain at all. With regard to other complaints, 23 had paralysis or weakness of legs; loss of bowel or bladder control in 8 cases; sensory disturbances in 4 cases; weak back in 16 cases; stiff back in 13 cases; inability to straighten back in 8 cases; inability to lift in 6 cases; shortness of breath in 3 cases; loss of sexual power in 3 cases; nervousness in 3 cases.

With regard to deformity, there is record in 58 cases, and there was deformity in 46 of these.

In 34 cases out of 81 there was dislocation of the vertebra.

All cases had some limitation of motion.

Paralysis was present in 23 cases out of 78.

With regard to location in the majority of cases, only one vertebra was involved. The series contains instances of fracture of all vertebrae except the first and second cervical, sixth cervical, and first dorsal, the first lumbar being most frequently injured (33 times).

In studying the radiographs it was seen that in most cases the vertebra above was driven against the one below, the latter being crushed, but in 20 per cent of the cases the reverse action occurred, the vertebra above being crushed.

—W. WARNER WATKINS, M. D.

The Bacteriology of Irradiated Tonsils. H. J. Ullman, M. D. and F. R. Nuzum, M. D., *Am. J. Roentgenol.* 10:396-398, May, 1923.

THE authors state that of 20 cases receiving roentgen irradiation of the tonsils 20 per cent underwent a marked gross change, became much smaller, and remained free from what the authors refer to as beta hemolytic streptococci (colony having a zone of complete hemolysis immediately about the colony varying from 1 to 4 mm. in width). An additional 35 per cent became free from the beta cocci for about six months and 45 still harbored these organisms during the entire series of exposures. No relation was observed between clinical and bacteriological results. Conclusions cannot yet be drawn from this study but a further study and report is contemplated.

The X-Ray Treatment of Tonsils and Adenoids. J. D. Southard, M. D., F. A. C. S., *J. Arkansas M. A.*, 18:130, Dec., 1922.

THE author has been using this treatment for more than a year and while his experience has not been large, it consists of a sufficient number of cases to assure him of its efficacy in children and adults.

His average technique is a seven or eight inch spark gap, 14 ma. min. at ten inch distance and 2 mm. Al. The rays pass underneath and internally to the lower maxilla, first from the front and then from behind. The same skin area is not covered oftener than once every two or three weeks. Eight to ten treatments to each tonsil is usually sufficient.

—W. WARNER WATKINS, M. D.

The Present Status of Radiation Treatment of the Tonsils. Carl F. Robinson, M. D., New York M. J. & Med. Rec., 117:39, Jan., 1923.

THIS author reports results upon a series of 156 cases treated with radium, in 145 of whom, six weeks after the radium application, only a small atrophied tonsil could be seen by pushing back the anterior pillar. Five cases only were unsatisfactory, the tonsil being fibrous and radiation therefore not suitable.

The technique is to bury two 12.5 mg. needles into the center of each tonsil under local anesthesia, leaving them in place from two to three hours.

References to the use of radium in treating tonsils are reviewed, and the fallacy of the claim that radiation treatment of tonsils will injure structures in the neck is shown.

It is possible to apply radium externally, using the same general principles as in the use of the x-ray. This is particularly applicable to children, where it is difficult to treat them by x-ray. However, the method of choice with the author is to bury radium needles in the tonsils and supplement this by x-ray, if necessary.

—W. WARNER WATKINS, M. D.

A Study of the Tonsil Question with a Preliminary Report of Roentgen Ray and Radium Therapy in the Treatment of Pathologic Tonsils. Laura A. Lane, M. D., F. A. C. S., Minnesota Med., 6:97, Feb., 1923.

THE tonsil question is still one of the most discussed in medicine. Too little attention has been paid to the after results of tonsillectomy and too many operations are done without securing permanent results.

A report from Johns Hopkins Hospital, based on 1000 cases examined before operation and from one to four years after operation, is very illuminating: 58 per cent showed mouth

breathing after operation; 55 per cent showed evidences of tissue left after operation; 40 per cent of operated patients were just as liable to sore throat after operation as before, the angina often being more diffuse.

Tonsillectomy is rarely of benefit in deforming arthritis, never in acute chorea, rarely in acute rheumatic fever, endocarditis, and chronic kidney lesion.

Treatment must look to the removal of the cause of the tonsil disease. Cleaning up a badly infected mouth is absolutely essential before instituting any form of treatment.

Patients with the following tonsil conditions should be operated unless presenting a serious heart, pulmonary, or grave physical contraindicating condition: (1) History of repeated attacks of tonsillitis and peritonsillar abscess. (2) Small, firm, sclerosed, submerged tonsils with frequent sore throats. (3) Badly diseased and abscessed tonsils causing acute polyarthritis, acute kidney lesion, certain eye lesions or other definite evidences of focal infection. (4) Cases of rapidly increasing deafness and ear infection due clearly to diseased tonsils and adenoids.

During the year ending September, 1922, the author has had under treatment and followed up, 52 patients treated with roentgen ray and 24 treated with radium or both combined. The results to date have been very satisfactory. The author's conclusions, drawn from literature and personal experience, are: (1) Study of more than 30,000 patients from various sources one to four years after operation shows permanent results in only about one-half of the total number. (2) The tonsil has a function and greater care should be taken to preserve this, especially in childhood. (3) Greater care is necessary in studying patients with tonsil disease and in selecting patients for operation. (4) Roentgen ray and radium offer a safe method of treatment in carefully selected cases. (5) Results in children and adults have been most striking in cases of a decided lymphoid hyperplasia type; also in patients with cervical adenitis associated with tonsil pathology. (6) Longer study is needed to prove the permanent disappearance of all symptoms accompanying tonsil and adenoid disease, and some further investigation on the types of tonsils best suited to this form of therapy is also needed.

A very complete bibliography accompanies this paper.

—W. WARNER WATKINS, M. D.

The Blood with Deep Roentgen Ray Therapy. Edwin M. Hirsch, M. D. and A. J. Petersen, M. D., J. A.

M. A., 80:1505, May 26, 1923. FROM a chemical study of the blood of patients treated in the routine way with high voltage x-rays the authors found "no striking or consistent alteration in the urea nitrogen, the total non-protein nitrogen, the uric acid, the creatinin or the sugar concentration * * * There is, however, a disturbance of the acid-base equilibrium, manifested immediately after treatment by an increase of the hydrogen-ion concentration, and an increased alkali reserve." After twenty-four hours these relationships are reversed.

Leukemia, with Observations on the Treatment and Findings. Emmett L. Irwin, M. D., New Orleans M. & S. J. 75:366, Jan., 1923.

THE following definition of leukemia is quoted from Ordway and Gorham: "Leukemia is a disease of the blood-forming tissues which produce leukocytes, manifesting itself by a marked hyperplasia of these tissues, characterized clinically by a remarkable increase in the number of white cells in the blood, and by varying grades of splenic and glandular enlargement. The leukemic white blood corpuscles vary from the normal leukocyte in many instances and are pathologic unripe cells gaining entrance into the blood before maturity."

Depending upon whether the myeloid or lymphoid tissue has become stimulated to a state of hyperplasia, we have myelogenous or lymphatic leukemia. Both forms have a tendency to run a chronic course, but either may occur in an acute and rapidly fatal form.

The cause has not been determined. The onset is gradual and is usually discovered late, the patient usually seeking advice for lassitude, progressive enlargement of the abdomen, dyspnea, or a mass in the abdomen; others seek advice on account of weakness, loss of weight, gastro-intestinal disturbances, dizziness, or hemorrhage from nose or bowel. The red cells and hemoglobin diminish as the disease progresses.

There are today only three recognized measures which have any effect upon the course of the disease, namely, benzol, radium and x-ray. The latter are preferred, and benzol should be used only on those patients who do not have access to radiotherapy. It is not believed that splenectomy is justified, but if performed, it should be done after radium and x-ray have reduced the size of the spleen. While the use of x-ray and radium are the best methods available today, these are only palliative, lengthening the patient's life, but not permanently curing him.

—W. WARNER WATKINS, M. D.

Roentgenologic Aspect of Chronic Appendicitis. Henry K. Pancoast, M. D., Arch. Surg. 6:85-88, Jan., 1923.

THE value of an x-ray examination in appendicitis is discussed under five headings: (1) congenital anomalies; (2) data obtainable from observation of the visualized appendix; (3) abnormal appearances in other structures; (4) the finding of some other condition accompanying appendicitis and requiring further surgical exploration; (5) the exclusion of any other surgical condition than a diseased appendix.

Only rarely is it either wise or necessary to submit a case of acute appendicitis to an x-ray gastro-intestinal examination.

Under the first heading is cited congenital transposition of the viscera, the cecum and appendix being found upon the left side in such cases; failure of complete rotation of the cecum is also noted.

Under the second heading the author states that the appendix cannot always be visualized. Neither visualization nor the lack of it is necessarily indicative of disease. There is lack of agreement regarding the relation between diseases and irregular filling. Study of the visualized structure must be mainly fluoroscopic and plates when made should be made under fluoroscopic control. Adhesions must be determined by the palpating spoon. A kink that cannot be straightened, or that recurs after straightening, is good evidence of adhesions. If the opaque contents remain after they have left the cecum poor drainage is inferred, though this does not necessarily mean pathology is present. The author says, "Whenever a retrocecal appendix is suspected because of its absence elsewhere and the evidence of adhesions or continued tenderness over the cecum, it is wise to continue the examination until the latter is empty." The significance of the finding of a retrocecal appendix must be considered jointly with the surgeon and the clinician.

Under the third heading it is stated that the appendix can be diseased without any manifestation anywhere. Adhesions, especially in connection with the terminal ileum, are most important. A kinked terminal ileum or one adherent to the cecum is probably due to a diseased appendix, providing no inflammatory pelvic disease is present. Iliac stasis is not reliable as a diagnostic sign. Definite pyloric spasm is a very suspicious sign though the cause may be a diseased gall-bladder or gall stones.

Under the fourth head ureteral stone is named as the most frequent finding, after which comes gall-bladder disease, gastric and duodenal ulcer in the upper

abdomen, diverticulitis of the colon, inflamed Meckel's diverticulum, early malignancy of the bowel, tuberculosis of the cecum and spinal disease. Ovarian and tubal disease or ectopic pregnancy are all beyond the power of x-ray diagnosis as a rule.

Fluoroscopic examination of the chest should be made a routine part of gastro-intestinal study. An adherent or restricted diaphragm due to a previous pneumonia has been found at times to account for abdominal symptoms.

"It would be too great a burden for the roentgenologist to make a routine gastro-intestinal study in every case of appendicitis unless his work was largely confined to that particular field. If, however, the symptomatology is in the least obscure or some other condition is suspected elsewhere in addition, a complete study is likely to justify the surgeon in limiting his exploration to the region of the appendix if no other condition is found, or to direct him to the proper field if a co-existing surgical condition is demonstrated."

Enteroliths. W. W. Boardman, M. D. Am. J. Roentgenol. 10:369-373, May, 1923.

Acute and chronic gastro-intestinal disturbances whose etiology is baffling have at times been demonstrated to be due to enteroliths. Although these are rare their possibility should be kept in mind and careful physical and x-ray studies made to determine whether they are the cause of the disease symptoms. The author states that in all obscure gastro-intestinal cases a thorough exploration should precede operative measures. He reports a very interesting case in his practice in which an enterolith was finally discovered. Mechanically it had acted as a ball valve, carried toward the recto-sigmoid junction it occluded the lumen of the bowel, carried back into the dilated curve of the sigmoid there occurred expulsion of gas and fecal matter. Thus the alternating periods and diarrhea were explained.

Enteroliths are of three kinds: hard, mostly composed of phosphates and carbonates and averaging two to three centimeters in diameter but occasionally much larger; soft enteroliths composed of indigestible fibers and membranes with a small amount of organic material, the so-called oatstone of Scotland belongs to this variety; lastly, the very rare enteroliths which follow the administration of mineral drugs.

Enteroliths are more frequently found in the large bowel than in the small one and may exist for years without causing any untoward symptom.

Even when they are of sufficient density to be revealed by the x-ray they may escape detection if a plate is not taken before the administration of the barium meal. Especially with the double meal technique, barium may obscure an enterolith in the sigmoid or the pelvic colon.

The routine barium meal may reveal the presence of an enterolith by a dilated and elongated section of the bowel, by a filling defect as a result of the varying densities of the enterolith and the barium, or if the meal be completely followed, by an intensification of the shadow cast by the adhesion of barium to the surface of the enterolith. Less definite findings will be given in the small bowel, the shadow resultant upon adherence of barium will be the most likely thing to reveal the enterolith's presence.

Peptic Ulcer with Deformities of the Viscus, Evidenced by X-Rays, Changed for the Better by Treatment. Max Einhorn, M. D., New York M. J. & M. Rec. 116:613, Dec. 6, 1922.

THIS paper attempts to answer the doubts of the surgeon regarding the efficacy of medical treatment of peptic ulcer, this doubt being expressed by Sir Berkeley Moynihan as follows: "We ask for a series of cases in which the physician, the surgeon and the radiographer are agreed that a gastric ulcer is present, in which medical treatment has been tried, in which all are confident that a healing of the ulcer has taken place, and that the healed ulcer has not again broken down * * * At present, I do not know of any such evidence I can accept."

A series of twelve cases is given, five being penetrating callous ulcers of the lesser curvature of the stomach, one a penetrating ulcer of the pylorus and six clear cut cases of duodenal ulcer with constant deformities of the cap. These cases were examined and treated between April, 1921, and April, 1922, the radiographic work being done by Dr. Wm. H. Stewart and Dr. H. A. Rafsky, before and after treatment.

They were all benefited by the duodenal alimentation treatment; there was a change for the better in the pathologic findings as revealed by the x-rays, the niche formation having entirely or almost entirely disappeared and the cap deformities likewise changing to almost normal conditions.

Based on these experiences, the author concludes that as a general rule, most varieties of the peptic ulcer, even the graver forms, are amenable to medical treatment.

—W. WARNER WATKINS, M. D.

The Roentgen Therapy of Tinnitus Aurium. Lyell Cary Kinney, M. D., *Am. J. Roentgenol.* 10:378-379, May, 1923.

FOURTEEN cases of tinnitus from chronic otitis media were treated by small doses of x-ray. The dose delivered was calculated to deliver approximately one-half of an erythema to both ears in one month; the factors of dosage were 135 kv., 5 ma., 6mm. Al, distance 60 cm., portal 5 cm. diameter. Two minutes were given on each side daily for eight doses with a weekly interval of rest. Each case received three such series and if no improvement was then apparent the treatment was abandoned.

If the tinnitus is the symptom of otosclerosis, prevention of increase is all that may be looked for and that only in early cases. If chronic otitis media is the cause of tinnitus relief may be expected. Improvement is due to anatomical changes and not to endocrine stimulation, the author believes. The x-ray is only an adjunct in treatment of tinnitus.

The Value of the Roentgen Study of Mastoid Disease in Children Under Five. Wm. A. Evans, M. D., *Am. J. Roentgenol.* 10: 382-385, May, 1923.

THE author disagrees with the authorities who claim that the pneumatization of the mastoid does not, except in rare cases, occur before three years of age. His findings in 7 cases less than one year of age, 46 less than five years of age, and 52 between the ages of five and ten revealed the following facts: (1) Pneumatic mastoid structure is frequently observed before the end of the first year of life. (2) The adult mastoid structure can be observed as early as the second year. (3) Stereo plates of good quality, of children under five, have definite diagnostic and prognostic value.

Roentgen Therapy of Acute Infections of the Antrum and Frontal Sinus. John D. Osmond, M. D., *Am. J. Roentgenol.* 10:374-376, May, 1923.

THIS paper reports the x-ray treatment of twelve cases of acute inflammation of the frontal sinus and antrum. Application of the ray was coincident with the relief symptoms, though as yet the author does not draw any definite conclusion as to the part played by the x-rays in bringing this about.

He issues these warnings to those who may try this form of treatment in a purulent sinusitis: First, the eyes must be protected from the rays; sec-

ond, the rays can be of no use in chronic conditions, and third, if pent up pus is present septicemia may result if treatment is instituted.

A Few Points in Radio-Therapeutic Technique of the Face and Mouth. Walter A. Weed, M. D., *Southern M. J.* 16:102, Feb., 1923.

AFTER the question of diagnosis, the indication for treatment, and the dosage have been determined, the predominant factor in the successful use of radium and x-ray is the technique of the mechanical application. Radiologists must work with the same precision and care as the most exacting surgeon does in the mechanics of surgery, before results will be uniform.

In lesions about the face and mouth, each case is an individual mechanical problem, but practically all cases will result satisfactorily, if the proper care is given to the mechanics of each. In basal cell lesions, the choice between x-ray and radium is largely one of convenience. Where there is considerable tumor formation, removal by thermo-coagulation preliminary to the use of x-ray or radium has been most satisfactory. The use of two series of needles connected by wires, the two poles of the high frequency current being brought into contact with the two sets, thus coagulating the entire mass is recommended.

—W. WARNER WATKINS, M. D.

The Use of Radium in the Treatment of Benign Hypertrophy of the Prostate. Warren A. Dennis, M. D., F. A. C. S., *Minnesota Med.* 6:9, Jan., 1923.

THIS author reports the use of radium by imbedding needles on the prostatic tissue, after the method of Barringer, for benign hypertrophy, with exceedingly encouraging results. Slight variations in technique were used, aiming to avoid a necrosis of tissue as was produced in his first case. From 300 to 400 milligram hours may be safely given at one sitting, and it seems to be better to use 25 mg. in one lobe than to split this between the lobes. The needles should be introduced first into the deepest portion of the gland on account of the shrinkage and fibrous tissue formation.

The placing of the needles is painless and there should be no discomfort if the urethra is not penetrated.

With the patient in the lithotomy position, a single wheal of local anesthetic is made in the skin of the perineum halfway between the anus and the scrotum. With the finger in the rectum as a guide, the tissues between the skin and the anterior surfaces of the two

lobes are then infiltrated and an incision 0.5 cm. long made in the skin. The needles are then inserted along the infiltrated tract into the substance of the prostate.

—W. WARNER WATKINS, M. D.

Remarks on Pyelography at a Lantern Demonstration before the Congress of Radiology and Physiotherapy. Sir John Thompson Walker, M. D., *Arch. Radiol. & Electroth.* 27:334-343, April, 1923.

AT a certain period in the history of hydronephrosis the kidney cannot be felt by palpation. At this period the distention is moderate, tissue destruction is slight and there is no infection. The complaint will usually be of recurrent abdominal pain. Pyelography becomes necessary if there is failure to find a movable kidney or stone in the pelvis, or infection. Fully developed hydronephrosis can be diagnosed without pyelography.

The solutions at first used for this procedure, collargol and thorium nitrate, have proved unsuitable for the purpose and at present sodium bromide or sodium iodide is being used. The author uses sodium bromide, as it is cheap, unchanged by boiling, and is clean. It should not, however, be used in a greater than 20 per cent solution as it produces irritation.

All retained fluids must be withdrawn by the catheter before injection is done and injection should be halted as soon as pain is felt. The catheters used should be of moderate size to allow escape of fluid along the sides (a precaution against overfilling the renal pelvis). The catheter is passed until arrested and then is withdrawn about one centimeter; otherwise, upon entering the upper calyx this will be distended and pain will be felt before the renal pelvis is filled. The patient lies with the head low as this position assists retention of fluid. It is very important that plates and tubes be in position for instant action since slight delay often leads to failure, and is dangerous in any case. There must also be provision for exposure of additional plates without delay in case these may be needed. Fluid should be removed at once after exposure. If first plates are unsatisfactory another injection is then made.

Previous experience in catheterization is necessary to the operator; the "occasional dabbler" has no place here and the novice in pyelography will be wise to make use of hydrostatic pressure as a guide in injecting the fluid. This is the best safeguard against overdistention and only the experienced operator is really safe without it. It should

be remembered that as hydronephrosis advances the pain of distention diminishes, and there are some patients who have strangely insensitive renal pelvises.

The essential points in reading a pyelographic plate are five: "(1) The normal pelvis is trumpet shaped and is set vertically on the upper end of the ureter, and from it the calices project laterally and antero-posteriorly. (2) The normal calyx has a short neck and expanded end, which is cup-shaped. In the hollow of the cup lies the apex of the pyramid. Calices seen end-on appear as rounded, darker patches near the outer border of the shadow of the pelvis. Usually most of the calices are seen projecting laterally. Occasionally a number of end-on calices are shown and they may resemble stone shadows. (3) An opaque catheter passes from the ureter vertically, or with a slight outward curve into the upper calyx. (4) The upper ureter, the lower margin of the renal pelvis, and the lowest calyx, form a symmetrical curve amounting to half a circle, which I have named the uretero-calicine curve. (5) The expansion of the ureter into the renal pelvis is gradual and there is nothing to mark the point of junction."

Regarding changes due to obstruction: (1) The earliest changes in the development of hydronephrosis are in the calices. The cup end of a calyx becomes rounded or club-shaped, so that the cupping disappears. The neck is shortened and broadened. In the advanced hydronephrosis the calices are represented by rounded bays. (2) The pelvis becomes rounded, sometimes square, upper margin elevated, lower margin depressed, however, the over distended renal pelvis has a rounded appearance that the trained eye quickly detects, the untrained must not mistake it for early hydronephrosis. (3) Uretero-calicine curve becomes an angle and gradually disappears. (4) Upper wall of the pelvis pushes upward and line of ureter and upper calyx is changed. The catheter will no longer enter the calyx but pushes the roof of the pelvis up like a tentpole, or catheter may coil into a loop. (5) There are also changes at the junction of the pelvis and ureter, lumen is narrowed, or angle of joining is altered. There may be a kink at the upper end of the ureter, if temporary it will be affected by position, if permanent it will be unaffected by either erect or horizontal position.

In speaking of other uses of pyelography the author says that usually a plate of good quality will suffice to localize a supposed stone shadow. It must be remembered that a small stone frequently moves from calyx to calyx. Every kidney stone is either in the pelvis

on in the calyx. In doubtful cases pyelography may be resorted to to demonstrate the exact position of the pelvis and calices and hence differentiate between renal and gall stones. This may also be accomplished by lateral radiography and pyelography.

Regarding lateral radiography the author says: "The ureter * * * reaches the anterior margin of the bodies of the vertebrae at the level of the fourth lumbar vertebra. The shadow of a stone in the pelvis, or in one of the calices, lies on the shadow of the vertebra. Where the stone lies at the extremity of a calyx, near the surface of the kidney, the shadow may lie behind the body of the vertebra. Where the stone is of great size, or there is a collection of stones with a much enlarged kidney, the shadow or shadows project beyond the anterior margin of the bodies of the vertebrae. With these exceptions the stone shadow will be found on the shadow of the vertebra body."

"With improved modern technique, gall stones are frequently shown on the x-ray plate, and the shadow or shadows lie in the right renal area of an anteroposterior radiogram. With a lateral view the gall stone shadows lie well in front of the bodies of the vertebrae and are usually lower down, apart from the character of the shadows."

Cancer of the Urinary Bladder Cured by Radium. Curtis Burnam, M. D. and George Walker, M. D., J. A. M. A. 80:1669, June 9, 1923.

THIS paper reports an infiltrating bladder cancer which was treated by transabdominal radium radiations and which has remained healed until the present writing, seven years after treatment. The authors conclude their paper with this summary: "The inference from this case, and it does not stand alone, is that in the treatment of cancer of the bladder the employment of gamma radiation from the exterior of the body is very valuable. It is also susceptible of wide application, as it can be combined with surgical operation and with topical application of radium, as well as with implantation of bare emanation tubes. It is possible, if adequate radium is available and proper use is made of it, to bring any desired amount of radiation to any part of the bladder without serious injury to the skin."

Cancer of the Cervix Uteri. J. L. Faure, M. D., Presse med. 31:461-463, May, 1923.

RADIUM is advised in all inoperable cases. Here its value as a palliative is proved and besides there is

always a chance that an inoperable case may be rendered operable under radium treatment. If one is doubtful whether a case is operable, the author would use radium, but he would operate in all cases where he believed it at all possible. In all cases other than the inoperable and the doubtful ones he advises operation providing the surgeon's experience has made him both skillful and speedy, otherwise radium is held the better treatment.

The author's experience with radium has not been altogether satisfactory. After a very remarkable recovery following radium application in a hopeless case he felt a great confidence in its efficacy and throughout the years 1910 to 1920 he used postoperative radium treatment in this type of cancer case, but when he found that time proved the percentage of recurrence slightly higher in the cases postoperatively treated than in those not so treated he changed his mind and discontinued postoperative treatments. He cites statistics from many gynecologists of various countries, claiming most excellent results from radium treatment, but he doubts them all. Dr. H. A. Kelly's sincerity and integrity he does not question but he believes that Dr. Kelly is deceived and that time will prove his present percentage of cures to be wrong. However, the author states that he himself may be mistaken and that the present technique, given time to prove itself, may induce him to change his own mind a few years hence.

Dr. Faure believes that the speed of the operation has a great deal to do with the results. The chance of recurrence increases with the length of time taken to do the operation; no operation should take longer than an hour, and an operation lasting longer than two hours he regards as a hopeless effort, because recurrence will be certain. This belief is strengthened by his observations of results obtained by operators whose skill is equal in all points except that of speed.

Radiation in the Treatment of Menorrhagia. D. A. Rinehart, M. D. J. Arkansas M. A. 19:175, Feb., 1923.

WHEN due to the following causes radiation is indicated for menorrhagia: Endometritis of various forms; fibromyomata of the uterus; and a third group in which there is no demonstrable pathology within the uterus and in which the symptoms are believed to be due to ovarian hyperfunction. Menorrhagia from all these causes occurs in all ages and in all types of patients.

If all palliative measures have failed to relieve a menorrhagia due to a non-

infective endometritis or ovarian dysfunction and occurring before the age of 35, it can be successfully controlled by the use of radium or x-ray. Ten years ago hysterectomy would have been employed.

Radiation is preferable to surgery in menorrhagia of severe degree caused by endometritis or ovarian dysfunction in young women, radium being preferred to x-ray if no infection is present. Radiation is indicated in all small and medium sized fibroid tumors of the uterus in all ages where operative relief would require hysterectomy. In young women surgery is indicated where myomectomy is possible, in fibroids of large size, in those that are pedunculated and those that have undergone degeneration.

Personal experience covers 93 cases with one unsuccessful result where operation showed a fibrous mass behind the uterus in addition to the fibroid, this mass containing placental tissue traceable to a ruptured ectopic pregnancy seven years earlier.

—W. WARNER WATKINS, M. D.

A Review of the Treatment of Hyperthyroidism by All Methods, with a Summary of the Authors' Experience with Roentgen Therapy. Thos. A. Grover, M. D., A. C. Christie, M. D., E. A. Merritt, M. D. Am. J. Roentgenol. 10:385-393, May, 1923.

THIS paper briefly reviews the history of the treatment of hyperthyroidism from the beginning and discusses present day methods fully. Statistics are quoted from the Mayo Clinic and from Crile.

The surgeons' objection that there is no proof of cure by roentgenotherapy is met with the statement that roentgenotherapy of hyperthyroidism is still in its infancy for only since 1915 has anything like uniform treatment been agreed upon; surgery has had forty years of trial and in 1900 was in about the same situation with respect to medical treatment that roentgenotherapy is now in with respect to surgery.

The surgeons' objection that further and irreparable damage will be done by the system during the time consumed by roentgen therapy, the authors do not believe is valid, because if roentgen therapy improves the case improvement will be apparent within a month and if not then surgery may be resorted to. If no longer period than this elapses operation will be more easily accomplished than it would have been without roentgen treatment, since the vascularity will be reduced by the rays. If kept within these bounds there will be no room for the objection that the difficulty of operation is increased by previous

roentgen therapy. Neither is the objection that roentgen treatment may produce hypothyroidism a valid objection. If there is any danger of this at all, it can be avoided by using the basal metabolic rate control.

The authors have treated 114 cases of hyperthyroidism and sufficient time has passed to establish the clinical cure of 32 of these, 24 are greatly improved and in general the results are satisfactory.

Their method is to give treatment over each lobe of the thyroid and over one area of the thymus region. Essentials are 5 ma., 9 inch gap, 8 inch distance, 5mm. Al for six minutes. Three successive doses are given at three week intervals and the basal metabolic rate is again determined three weeks after the third treatment. A fourth treatment is usually found necessary. Thereafter treatment is at monthly intervals until, at the most, three or more have been given.

General management and treatment of patient is decidedly stressed as an important factor.

The authors conclude that "Comparison of the results obtained in treatment of hyperthyroidism by surgery and the roentgen ray indicates that these two methods are probably about equal in the percentage of permanent cures.

"Patients with hyperthyroidism should first receive roentgen treatment, and thyroidectomy only if they fail to respond to this treatment.

"The general management of patients with hyperthyroidism is of prime importance whether the ultimate treatment is to be roentgen ray or surgery."

The Value of Anti-Cancer Campaigns. Editorial, World's Health (Red Cross) 4:24-26, April, 1923.

THIS editorial contains an interesting summary of the work being done in various countries to combat the spread and increase of cancer. Dr. Woglom of Columbia University, New York City, and Dr. Bloodgood of Johns Hopkins are quoted as witnesses to the value of the work already done in certain sections of our country.

The French organization, *La Ligue Franco-Anglo-Américaine Contre le Cancer*, has a program which includes research, maintenance of cancer hospitals and dispensaries, and popular educational propaganda.

The Spanish Red Cross and the South African Red Cross have both undertaken special propaganda.

In Switzerland the *Association Suisse Pour la Lutte le Cancer* is carrying on active propaganda and is collecting statistics for research.

Aside from voluntary associations many public health departments have undertaken the work of cancer propaganda. The U. S. Public Health Service, the Department of Public Health of Western Australia, and of New Zealand, and several health departments in Great Britain have issued pamphlets in the effort to spread the knowledge of cancer prevention and treatment. The recently formed Cancer Committee of the French Ministry of Health includes educational propaganda on its program and the Committee on Cancer of the British Ministry of Health contemplates similar propaganda.

The editorial voiced the hope that the question of educational campaigns against this disease would be brought up at the Inter-Allied Congress on Cancer, which was to hold a meeting in July at Strasburg. The editor believes that evidence presented by countries carrying on this propaganda would do much to intensify future efforts.

The Immediate Effect of Radium and X-Rays on Enzyme Action. S. Clement Roth and John J. Morton, M. D. Am. J. Roentgenol. 10: 407-408, May, 1923.

THE authors say in the conclusion of this report: "From a consideration of the results which follow the radiation of pepsin solutions by x-rays and the gamma rays of radium, there does not appear to be any definite effect on the enzyme activity which was determined by the edestain, globulin and Mett methods. Such slight variations as were noticed fall within the limits of experimental error."

The Problem of Radium and Surgery in the Treatment of Cancer. A. Strauss, M. D., Ohio State M. J. 19:85, Feb., 1923.

DR. STRAUSS advocates the following methods: Because of the high operative mortality, the mutilating operation to which few will submit and the low percentage of cures, cancer of the tongue is to be treated with radium to the local lesion and radium plus surgery to the glands of the neck. This also applies to recurrences and carcinoma of the lower lip. Carcinoma of the breast is still considered a surgical disease with radium and x-rays as efficient aids. In fundus cancer, heavy intrauterine doses of radium should be applied before hysterectomy. Radium is generally extending its usefulness in both operable and borderline cases of cervical carcinoma. After raying, no case of cancer of the cervix should be operated, because the recurrence will be in the parametrium. Radium is ef-

fecting nearly the same percentage of cures as surgery in cancer of the rectum, but a preliminary colostomy is required to prevent pain.

—W. WARNER WATKINS, M. D.

Preliminary Report of Results and Conclusion from One Year's Experience in High Voltage Roentgen Therapy. Roscoe L. Smith, M. D., Nebraska M. J. 8:41, Feb., 1923.

DRING the past year the author has treated over 200 cases of malignancy, most of them with extensive involvement. The original tumors have disappeared in practically every instance and the patients showed marked improvement. In about half the cases, the improvement was only temporary. Fully one half of the cases have remained well to date.

—W. WARNER WATKINS, M. D.

Advances in Roentgen Therapy with Special Reference to High Voltage Homogeneous Rays. Wm. H. Diefenbach, M. D., New York M. J. & M. Rec., 117:354, March 21, 1923.

THE elements of the new roentgen ray therapy with the production of homogenous rays of deep penetration as we employ them are as follows:

1. Voltage controlled by sphere gap. Maximum crest at 300,000 volts.
2. Milliamperage controlled by a double meter and carefully watched by an attendant. Milliamperage kept at 4 ma.
3. Spark gap at a maximum of 20 inches, employing 16 to 18 inches.
4. Distance target to tissues, 20 to 28 inches.
5. One-sixth mm. of silver with secondary wood filter has been used for the past five years.
6. Unless contraindications are present, the primary inhibitive dose is forty minutes over one area. Two or three areas are used at one seance in certain deep seated lesions or when cross-firing is employed.
7. Ionization measurements have not been employed, as yet.
8. Repetition of dose requires experienced judgment. Do not repeat under two weeks as a rule, and preferably three weeks.
9. Area to be rayed should be larger than the visible lesion, the larger the better. Viscera not to be rayed should be protected. Adjacent and distant lymphatics should be rayed after the original focus has been treated.
10. Secondary rays are produced in the tissues following roentgen ray treatments and these may cause constitutional effects.

—W. WARNER WATKINS, M. D.

The Relation of Radiology to Cancer Control. Chairman's Address, Section on Radiology Southern Medical Association, 16th Annual Meeting, Chattanooga, Nov. 13-16, 1922. Thos. A. Groover, M. D., Southern M. J., 16:11, Jan. 1923.

IN the science of medicine, there is no "authority", and this is peculiarly applicable to the problems of cancer, and the knowledge of this should temper our enthusiastic reception of the literature distributed relating to the control of cancer. In much of this literature, radiology is referred to mainly for the purpose of warning against it, and under the guise of a public health crusade leaders in medical thought have given expression to similar sentiments. The facts in the case do not justify such pronouncements, for whatever the future of radiology may be, the radiologist is seeing more cancer at the present time than anyone else, and his is an unparalleled opportunity for gaining a comprehensive knowledge of the disease in its various aspects.

Cancer should not be handled by rote, regardless of the method employed. If we as radiologists are content to bathe a mysterious growth with a more mysterious ray, without attempting to analyze the reasons for success in one instance and failure in another, we are not living up to our opportunities nor fulfilling our duty. It is obviously futile to advise the layman to seek medical advice early, unless there is some reasonable assurance that the advice he receives will be sound; that this is frequently not the case, all who come in contact with many cancer cases will attest. We are all familiar with the stock advice and treatment given many patients showing early lesions, such as "Forget it"; "We'll watch it for a while"; "A little salve"; "Paint it with iodine"; "Touch it with caustic"; "Snip it off"; "A little x-ray or radium".

"Watch it grow!" may be a fine slogan for many enterprises, but it is a pernicious one for any lesion that resembles cancer.

In mapping out a plan of attack on cancer, or a potential cancer, we must always keep clear the issue involved, namely, that if we fail to destroy the cancer utterly and completely, the cancer inevitably will destroy the patient. The radiologist has been unduly handicapped by the idea that under no circumstances must he destroy healthy cells. The radiologist must be granted some of the ruthlessness which is granted the surgeon. This may eventuate in establishing a mortality rate chargeable to the treatment, but there is no reason why the radiologist should

not be entitled to the same privileges and immunities in this regard that his surgical confreres enjoy.

We are coming to realize that it is extremely hazardous to speak of curing cancer, and it may be that the evaluation of a method of treatment could better be expressed in terms of longevity and well being instead of percentages of so-called cures. We may frankly admit that while we have many "cures" we have not as yet, in a true sense, a cure for this dread disease.

—W. WARNER WATKINS, M. D.

The Electrodeless Discharge in Iodine and in Hydrogen. John K. Robertson. Tr. Royal Society, Canada, 16:151-155, Sect. III, 1922.

THIS paper describes and gives the results of an experimental study of the discharge resultant upon changing the excitant in pure dry hydrogen contained in an observation bulb. The bulb was suspended inside a coil of six coplanar turns of stout copper wire through which was passed the high frequency discharge from two Leyden jars charged by means of a small interrupterless x-ray transformer, the intensity of excitation being varied by changing the spark gap.

A previous study upon iodine at temperatures from -5° C. to 5° C. had shown a ring discharge of pale yellow when a sphere gap of the order of 1 mm. was used. The spectroscope showed this to be a continuous band from red to green followed by an absorption band which was followed by a continuous band of blue-violet. With increased spark-gap there was an abrupt change to pale green whose inner border was pink, this the spectroscope showed to have numerous bright lines with a faint continuous background in the red region. The pink border probably corresponds "to the lesser degree of dissociation one might expect in the weaker electric field nearer the center of the bulb—the lines in the pink were much feebler than in the green—what one would expect from a smaller degree of dissociation."

In hydrogen four distinctly different colored charges were observed: "(1) *whitish* in which the Balmer lines are almost absent; (2) *pink* in which both line and secondary spectra are strongly developed; (3) *red* in which "eta alpha" and "eta beta" are relatively strong and at least a portion of the secondary is absent; (4) *blue* in which, according to Masson, the secondary is entirely absent, and, moreover, "alpha beta" is stronger than "eta beta." Concerning this last point the author intends to make further study.

The interpretation of these results is not easy. It is generally assumed that

the Balmer lines have their origin in the atom, the secondary spectrum in the molecule. But the secondary spectrum is very complex. The writer's results indicate that in a region where the Balmer lines are relatively strong (a condition which is only obtained with strong excitation), a portion of the many lined spectrum, as well as the continuous background, is feeble or absent altogether, while another group of these between "lambda" 4316 and "lambda" 4136 is strongly developed. If now we make the assumption * * * that the atom is the origin of the Balmer lines, this suggests that at least some of the lines of the secondary also may be associated with the atom. On the other hand it is well to remember that in strongly excited gas we may have not only neutral atoms and molecules, but ionized molecules. Moreover, * * * the work of dissociation plus the ionization of an atom is less than the work required to ionize a molecule. Accordingly, ionized molecules do not appear until the excitation is tolerably strong and it may be that in them is found the origin of a portion of the secondary. But the problem is far from solution and one can only make suggestions and continue observations.

"In regard to another point it has been difficult to give any explanation. It has been stated above that the red discharge (showing the Balmer lines relatively strongly developed) formed the inner portion of the discharge ring, the outer being pink. Now the expression from which one may calculate the value of the electric intensity at any point within a coil of co-planar turns shows that the field is weaker nearer the center of the coil. * * * Why is it, then, that the red discharge, which is evidence of an excess of atomic hydrogen, is on the inner portion of the ring? The question is all the more puzzling because in iodine, as noted above, the reverse was the case. The inner portion of the ring showed the lines less strongly developed, as one would expect to be the case in the weaker field. The writer has no explanation to offer."

The author contemplates further work upon this problem.

The Electrodeless Discharge in Certain Vapors. John K. Robertson. *Physical Review*, N. S. 19:470-477, May, 1922.

ELECTRODELESS discharge as a source of sharp lines should be of value in measuring wave lengths and in analyzing, with an instrument of high dispersion, lines with components due to isotopes.

This paper gives the results of the author's study upon iodine (see preced-

ing abstract), potassium, sodium, lithium and mercury.

In potassium at a temperature of from 250° to 300° C. the ring discharge is not so sharply defined as in iodine. It consists of a pale green portion with an outer border of orange yellow, and a violet region may be seen if sufficient electrical intensity is used. With the small dispersion of the spectroscopy available, exact measurements of wave length were not possible. The author from his observations, however, believes that "one might expect for potassium lines a separation of possible components approximately (0.002 to 0.005) x 207/40 or (0.01 Angstrom units to 0.025 Angstrom units)."

Sodium at a temperature above 300° C. gave a brilliant yellow discharge. "In addition to the D lines, the first four doublets of the diffuse series were identified as well as the first three of the sharp series. The Balmer lines of hydrogen, the most likely impurity, were not visible."

The lithium used was of unknown purity. "By using an iron capsule in the side tube a small quantity of the metal was vaporized and deposited in the bulb, but although the oven was heated as high as 500° C. nothing but a feeble discharge due to impurities was obtained."

With mercury a brilliant white discharge was obtained at 70° to 110° C. or higher, "the exact temperature at which it disappeared increasing with increasing spark gap. On the other hand observations made with spark gap 1 mm., 2 mm., 4 mm. and 6 mm. in length indicated that the temperature at which the glow begins (110° to 115°) is independent of the electrical intensity. The origin, therefore, of the continuous spectrum is probably closely connected with the density of the vapor. Very recently R. W. Wood has made the statement that mercury vapor can be made to fluoresce only when freshly liberated from the fluid metal, and suggests that the formation of diatomic molecules is necessary for the phenomenon of fluorescence. That such a grouping of atoms is possible is evident from the work of Sir J. J. Thompson on positive rays, in the course of which he showed that even at the low pressures obtaining in his discharge tubes, it was possible to have clusters of four mercury atoms with a single positive charge. As such groupings would occur much more readily at vapor densities corresponding to temperatures over 100° C. it would seem that the 'radiators' of the continuous spectrum are to be found in such clusters, an idea which has been previously suggested by more than one writer.

"With the temperature of the vapor approximately constant (at say 90° C.), observations were made at various spark lengths. It was found that below a minimum gap length (of the order of 0.5 mm.) the bright white discharge gave way to a faint white luminosity whose intensity was greater in the plane of the coil, while above this length, the ring discharge disappeared."

Dosage Tables for Roentgenology. By Dr. G. Holzknecht, Professor of Radiology at the University and Chief of the Central-Roentgen Institute of the General Hospital, Wien, Germany. Price sh. 2:6. Published by Franz Deuticke. Address: Frank Deuticke Verlag, I, Helfferstorferstr. 4, Wien, Germany.

THESE tables, printed in very readable type on a single sheet of paper 24 by 12 inches, are cleverly and concisely arranged to give the dosage and technique for every type of x-ray treatment which the author has found worth while in his practice. The scheme is the result of the author's effort to present the technique in a simple, compact, workable form for others to follow. A pamphlet (12 mo) of 33 pages accompanies the tables and contains an index to the technique as well as much additional information concerning the treatment of specific lesions.

The author states that the technique herein described may be safely and successfully used by anyone who knows how to properly handle x-ray apparatus, but he emphatically states that this knowledge and skill is requisite and that nothing but study and training will supply it.

There are two indexes given. One is a general index alphabetically arranged, while the other groups the names of the lesions according to the nature, location found, etc. Opposite the name of each lesion appears a Roman numeral which refers one to the table. For instance both acne vulgaris and carbuncle have the Roman numeral VI printed after them, and by referring to this number in the table one finds the general technique tabulated. Exceptions and deviations from the general technique are given in the table and any further necessary information is supplied in the pamphlet and is found by reference to the page number given in the table.

The technique is the latest tried out by Dr. Holzknecht and he states that it is not intended to be so hard and fast that no variation from it is possible. It is meant to be flexible enough to be varied as the individual case may require.

This publication should be very useful to radiologists having a fair knowledge of the German language.